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OUR FOREIGN CONTACTS

Occasionally an author receives a comment from a foreign country on some article which he has written for INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Occasionally, too, an advertiser receives an inquiry for his product from some distant land. Then comes an expression of surprise that the publication has a foreign circulation.

Candor compels us to state that this type of circulation is not large, yet it is scattered over many countries. Canada is foremost on the foreign list. Every country of Europe is represented, including even Russia. Then there are subscribers in India, Africa, China, Japan, South America, and Central America.

One of the surprising things connected with this foreign circulation is found in the fact that central Europe should take so kindly to an American publication. When it is considered, for instance, that Germany has led in the field of vocational education, it becomes doubly surprising that German teachers should draw upon the new world for inspiration and guidance in this type of work.

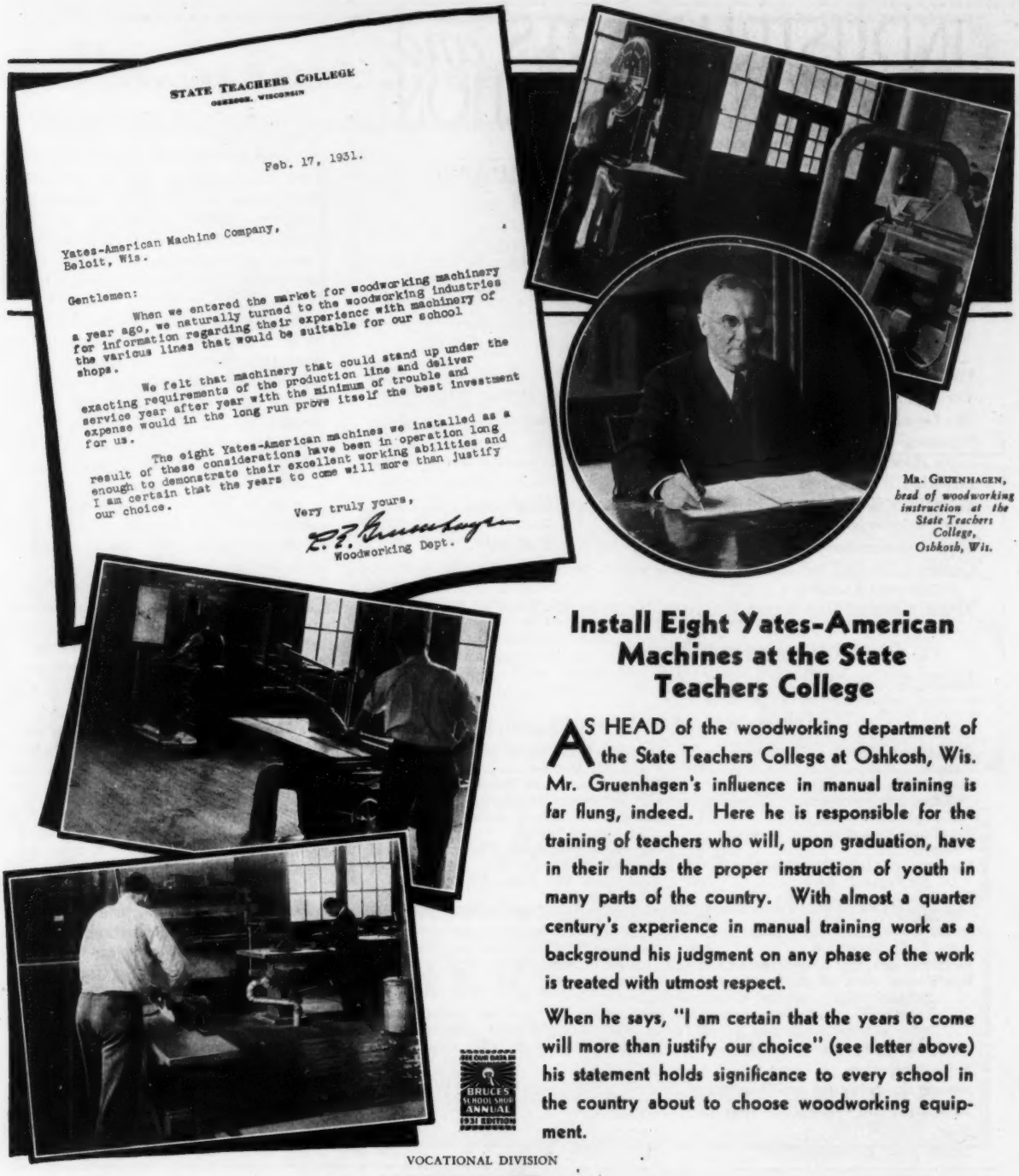
The answer to this may probably be found in the fact that the world war wiped out hundreds of technical publications in Europe and that the conditions since then have not been favorable to their revival. Again, the several countries of Europe, more specially those that have changed from a monarchical type government to that of a republic, naturally turn to this country for inspiration.

In their efforts to regain the prestige and prosperity of a former day these countries are anxious to learn from enterprising, energetic America, hence a publication like the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, reflecting as it does the latest and best thought in the field which it serves, has its attractions for the educators in Europe.

THIS MONTH'S COVER

The picture on our cover this month shows a class of electrical students at maintenance work in the electrical shop practice class at Seneca Vocational High School, Buffalo, N. Y.

Photo by Hiram E. Greiner, Old Central High School, Buffalo, N. Y.



STATE TEACHERS COLLEGE
OSHKOSH, WISCONSIN

Feb. 17, 1931.

Yates-American Machine Company,
Beloit, Wis.

Gentlemen:

When we entered the market for woodworking machinery a year ago, we naturally turned to the woodworking industries for information regarding their experience with machinery of the various lines that would be suitable for our school shops.

We felt that machinery that could stand up under the exacting requirements of the production line and deliver service year after year with the minimum of trouble and expense would in the long run prove itself the best investment for us.

The eight Yates-American machines we installed as a result of these considerations have been in operation long enough to demonstrate their excellent working abilities and I am certain that the years to come will more than justify our choice.

Very truly yours,
E. F. Gruenhagen
Woodworking Dept.

MR. GRUENHAGEN, *head of woodworking instruction at the State Teachers College, Oshkosh, Wis.*

Install Eight Yates-American Machines at the State Teachers College

AS HEAD of the woodworking department of the State Teachers College at Oshkosh, Wis. Mr. Gruenhagen's influence in manual training is far flung, indeed. Here he is responsible for the training of teachers who will, upon graduation, have in their hands the proper instruction of youth in many parts of the country. With almost a quarter century's experience in manual training work as a background his judgment on any phase of the work is treated with utmost respect.

When he says, "I am certain that the years to come will more than justify our choice" (see letter above) his statement holds significance to every school in the country about to choose woodworking equipment.

SEE OUR DATA IN BRUCE'S SCHOOL SHOP ANNUAL 1931 EDITION

VOCATIONAL DIVISION

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Volume 20 JULY, 1931 Number 7

Preparation and Use of Lesson Sheets

*Harold J. Van Westrienen**

ANY worth-while program or technique in education must be based upon a sound philosophy. Unless lesson sheets are a contributing factor in a well-thought-out educational program, their use cannot be justified. Any teaching device, no matter how valuable, must be an integrated unit in a comprehensive scheme or its values will be largely dissipated.

Students cannot be taught vision and self-direction by being assigned ten pages of history each day. Neither will students develop these abilities by being given a set list of teacher-directed projects as their semester's assignment. When students are required to sit rigidly in their seats, without being allowed to talk to or assist each other, they cannot be expected to develop into coöperative citizens. If they are forced to abide by autocratic rules they cannot be expected to be efficient at self-government and possess initiative in adult life. Their training has conditioned them to act otherwise.

Present-day education, then, demands a less formal procedure or classroom method. It requires more opportunity for self-control, self-direction, self-appraisal, and creative effort, with results or goals in terms of ideals and powers rather than subject matter and skill. Skill and knowledge will be resultant by-products and will still be essential as a means to an end, the end being worthy individual and social ideals, attitudes, and powers.

A democratic or student-control method of classroom organization forms the basis for achieving these goals. With the informal student control allowing more choice on the part of the student, the teacher finds the traditional list of projects obsolete. He will also find it awkward, if not impossible, to assign new projects, give numerous and lengthy demonstrations and carry out all of his other responsibilities effectively. This is especially true in the general shop. The only answer to the problem is some form of lesson and instruction sheets.

The traditional job sheet is not adequate for several reasons. It is written on a basis of teacher direction with subject matter and skill as goals. The new education must provide for goals in terms of worthy individual and social purposes and allow for student choice and self-direction. The answer has been a new type of lesson which has the following characteristics. These lessons should:

1. Stimulate the student to worthy individual and social purposes.
2. Reveal to the student the many opportunities of the course.
3. Serve the needs of students of varying abilities, and cater to individual differences through a variety of optional and graduated assignments.
4. Serve as a means of enriching the experiences of the student by presenting the real values in the cultural heritage of the race.
5. Make all of the teacher's time available for giving individual assistance where students desire or require help in solving problems which involve purposing, planning, executing, judging, or generalizing.
6. Serve as a solution for the large class problem in an adequate and efficient manner.
7. Relieve the teacher of many of the formal demonstrations and lectures that are too often inadequate, spontaneous, and energy consuming. Students who are absent, slow thinking, or unable to see clearly, miss out on these traditional demonstrations.
8. Make it possible to eliminate the formal textbook. An adequate number of copies of several carefully selected reference books should serve the supplementary needs of the student.

The Administration and Use of Lesson Sheets

The traditional shop course was formerly introduced to the students by a long series of demonstrations covering every process and operation that the student required during the course. Active students resent having to listen when they might better be digging much of it out for themselves at the time they need it. This situation can be solved by means of adequate lesson and instruction sheets.

*Director Vocational Education, Hamtramck Public Schools, Hamtramck, Michigan.

The following definitions describe the general characteristics of each type of sheet and where it should be used.

a) The *lesson sheet* is a teaching device to be used by the teacher in presenting the opportunities in each unit of work to the class. It should replace the traditional verbal assignments, and replace or supplement, as far as possible, the stimulating and orientating oral discussion usually given by the teacher when a new project is launched. The lesson sheet should contain stimulation; orientation; a minimum of supplementary information; a description of the methods to be used; assignments of activities; and references to texts, instruction and information sheets that are available. Any lesson sheet should keep the entire class interested and profitably occupied over the rather definite period of time allotted to the topic involved.

b) The *instruction sheet* should describe specific

Typical Lesson Sheet

8B — HOUSEHOLD MECHANICS

Unit — Sheet Metal

Arranged by E. MICHAELSON, *Hamtramck Public Schools*

Lesson I. Things to Make That Will be Helpful to Others.

When you help others it makes them happy and gives them the desire to do something for you. You also have the pleasure of knowing that you have done something worth while and given someone pleasure.

Did you ever think of the many ways in which your mother tries to please you. She washes and mends your clothes, she makes your bed, she does her best to provide you with good food to make you strong and healthy, and does many other things for your comfort and welfare. She would do many other things if she were able.

Wouldn't you like to do something for her that would make her work easier or more enjoyable? There are many things you could make from sheet metal that would be useful to your mother in her cooking.

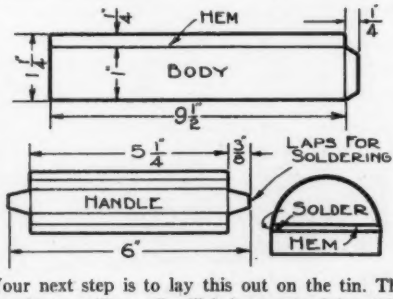
This lesson was written to help you in constructing things that will be interesting to make and useful to your mother. Surprise her by bringing home a useful article that will also show that you are a good workman.

C–Assignment

Your mother probably enjoys making cookies for you and the members of your family. If you do not get cookies as often as you like, possibly it is because your mother does not have a cookie cutter. This assignment will help you in making a cookie cutter that you can give to your mother.

1. The first thing to consider is the *shape*. The ordinary cookies are round, but you might like to make one shaped like a heart, four-leaved clover, star, etc., that could be used for special occasions such as St. Patrick's Day, Christmas, Easter, St. Valentine's Day, or some other occasion.

a) Make a drawing the exact size and shape you desire your cookies to be.



b) Your next step is to lay this out on the tin. The instruction sheet on "layout" will help you in doing this.

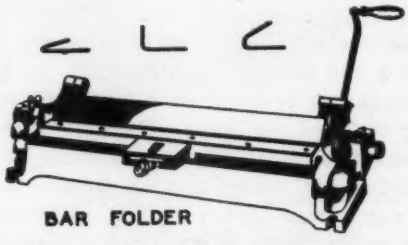
In laying out the parts, select a small piece of scrap tin or use a corner of a larger sheet to prevent waste. Waste in the school shop means higher taxes.

a) Cutting out the parts from the metal.

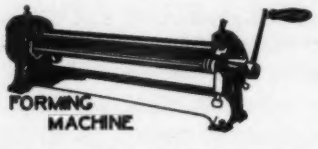
The metal is cut with a tool called a tin snip. Unless you have used a pair before, you may find it difficult to get good results. You will find the instruction sheet on "The use of the tin snips" helpful.

3. After your parts are cut out, the next operation will be hemming the edges of the handle and the top of the cutter to add strength and make the edges smooth so your mother will not cut her hands when using the cutter.

This operation is done on the bar folder. The instruction sheet on the bar folder will help you in making a seam that is even and attractive.



4. Your next operation will be to form or roll the cutter round. This is done on the forming machine. You will find the instruction sheet on the use of the forming machine helpful in obtaining a good job.



5. Your last step will be to solder the seams and assemble the two parts. This is done with a soldering copper. If you have not used one before, see the instruction sheet on soldering.

B–Assignment

If you desire to learn other ways to be helpful, select one of the following assignments.

1. Make something else from tin that will be useful to you or someone else, such as a doughnut cutter, another cookie cutter (different shape — heart, star, etc.).
2. Prepare a poster illustrating a way to be helpful, using the information received in this lesson.
3. Write a poem illustrating some application for this lesson.
4. Write a 100-word essay on helpfulness, tin, soldering, or some other phase of this lesson.

A–Assignment

Work out some original project that will be helpful to you or someone else.

References: The following references will help you in learning more about working with sheet metal:

Elements of Sheet Metal Work, by R. L. Welch.[1]
Course in Sheet Metal, by J. W. Bollinger.[2]
Sheet Metal Work, by Trew & Bird.[2]

[1]The Bruce Publishing Co., Milwaukee, Wis.
[2]Manual Arts Press, Peoria, Ill.

operations or processes in explicit detail. It should be available to the students whenever they see a need for some specific instruction. Practice exercises should be suggested but the instruction sheet should not contain project assignments. This type of sheet should, as far as possible, supplement or take the place of the traditional demonstrations.

c) The *information sheet* is a means of furnishing rather complete related technical information to the student who desires more knowledge upon any specific

Typical Lesson Sheet

BENCH METAL WORK

Instruction Sheet — The Art of Filing

Arranged by J. W. GIACHINO

Purpose: This lesson is written to help those who have to cut, smooth, or fit metal objects. This can be done with a file.

A file is a piece of hardened steel on the faces of which are ridges or teeth. A sketch of a file is given below. You

will need to know and remember the names of the various parts of the file to be able to read intelligently the instructions which are to follow.

Test yourself to make sure you know each of the following parts of a file without looking at the sketch:

1. Point 2. Teeth 3. Edge
4. Heel 5. Tang

The file probably appears to a beginner as one of the easiest tools to use. This is not so, for it requires considerable practice to get good results. Filing may be called an art by itself. You should try to learn this art so that you may become a skilled workman, and thereby improve the quality of your projects.

How to Choose the Right File. Files are made in many styles, each intended to serve a different type of work. You should be able to choose the kinds most nearly suited to your various needs.

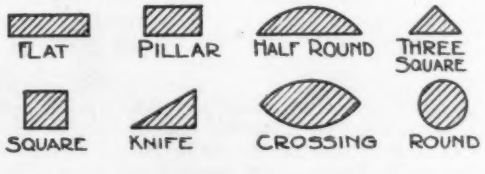
Files are divided into two classes, "single-cut" and "double-cut." A single-cut file has a single series of teeth

or ridges running across its faces, while a double-cut file has a double series of ridges crossing each other.

A single-cut file cuts the metal smoother, but a double-cut file cuts the metal faster.

The distance between the ridges determines the degree of roughness or smoothness of a file. There are six main graduations; rough, coarse, bastard, second cut, smooth, and dead smooth. Each type has a certain number of teeth to the inch.

The length of a file is measured from the point to the heel (the tang is not included).



Files may be obtained in a number of different shapes, such as round, square, flat, triangular, half-round, oval, etc.

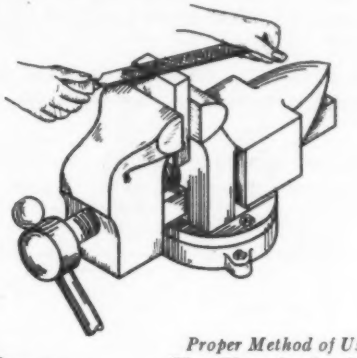
Some day you may wish to purchase a file. Unless you are familiar with the various things mentioned, you may be at a loss as to what type to buy.

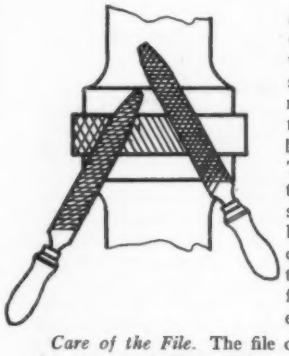
Using the File

Warning: You are apt to receive some serious injuries by using a file in a careless manner. The file has a very sharp tang, which, if not covered by a handle, may cut into the hand or arm. Therefore, always put a handle on the file.

Method of Holding the File. Regardless of how simple a file looks, a good machinist will tell you that unless it is properly used, poor work will result. The following instructions will help you to avoid many of the common mistakes.

The position for filing should be such that the worker will get the full swing of his arms from the shoulder. He should stand with feet apart, one foot ahead of the other. The handle should be grasped with the right hand (unless left-handed). The palm of the left hand should be resting on the end of the file with the fingers curled underneath, as shown in the illustration.





Proper Method of Using the File. Place the tip of the file on the work and push forward with just enough pressure to cut the metal. On the return stroke the file should either be slightly raised or lightly dragged back over the work. The file is made to cut only on the forward stroke. If the pressure is not relieved on the backward stroke the teeth will chip off. Keep the file level on the metal, otherwise the surfaces will be rounded or uneven.

Care of the File. The file often becomes clogged during the process of filing. This is caused by small particles of metal becoming lodged between the teeth. Unless the file is properly taken care of, it will soon become unfit for use.

The particles of metal can be removed with a wire brush called a "file card," by rubbing the "file card" over the file in the direction of the cuts. Rubbing chalk over the file teeth before using will make cleaning easier.

Suggestions

The following will help you in determining whether you understand the proper use of a file:

1. Secure test sheet on filing and answer the questions.
2. Obtain check sheet and check you answers.
3. Determine your grade and turn in the paper to the instructor.
4. If you desire to know more about the art of filing, further information may be found in *Machine Tool Operation* by Burghardt.[1]

[1]McGraw-Hill Book Co., New York City.

topic that has been suggested by the lesson sheet. It should be concise, accurate, and adequate to the needs of the students.

Technique of Writing Lesson, Instruction, and Information Sheets

The following points should be considered in writing lesson and instruction sheets:

1. Introduce the lesson sheet with a short paragraph or two that will *stimulate* the student, and *orient* him on the topic or project.

2. Begin all descriptive paragraphs with *positive statements* that go right to the point and convey the essence of the entire paragraph.

3. Divide the sheet into specific parts and use suggestive headings to represent each division.

4. State a *purpose* or reason for each lesson, and for each assignment or each bit of information that is presented. Justify every bit of information or assignment in terms of the pupil's needs. Assume that the material has not been within the scope of the student's past experiences. Let him know in what way the lesson will aid him.

5. *Write directly* to the pupil. Give the impression that the lesson is written as a service to him individually.

6. Do not tell anything that can be put into a simple assignment for the student to do himself. This will provide a means for the pupil to take a *personal inventory* of his past experiences, and it will reveal the need for further instruction or learning. The assignments should be designed so as to meet the needs of various levels of ability and aptitude of the students.

C-Assignments should contain teacher-directed activities involving the real values in the cultural heritage of the past. They should constitute exercises or projects involving the minimum essentials for the course. From 40 to 60 per cent of the students will be unable to accomplish any more than the C-Assignment.

B-Assignments should involve the application of the facts presented in the lesson and C-Assignment. They should allow a variety of choices within definite limits, and should be additional work that only 20 to 30 per cent of the students can do.

A-Assignments should involve *free choice* on a *creative level* for the best 5 to 10 per cent of the students who have original ideas to express.

7. All activities and discussions should be based on the normal, natural, choices, experience, and abilities of the pupil. The emotional reactions of a student of the age for which the lessons are being written must be considered.

8. A picture is more easily understood than the written description and should supplement it. *Illustrations* should be used as a means of showing methods,

Typical Lesson Sheet

PRINTING I

Unit A — How to Set Type

Arranged by W. G. Williams, *Hamtramck Public Schools*

These lessons are written for the purpose of helping those who desire to know how to set type.

Lesson I. Where the Type is Kept

1. *How and Where the Type is Kept.* In order to be able to set type successfully one must know where type is kept and where each letter belongs. The pieces of type are kept in shallow drawers called "cases." These cases are divided into many small sections, each section containing a certain letter. The arrangement of the characters in the case is called the "lay" of the case. At first glance the lay of the case looks very hard to learn (complicated), but on studying it closely you will find that this is not so.

a) The Arrangement of Capital Letters. You will discover that the capitals (upper-case letters) are all in one division of the case in alphabetical order, except the J and U which are placed in the last sections.

b) The Arrangement of the Small Letters and Figures. In printing, small letters are called "lower-case" letters. They are arranged according to the number of times they are used. For example, the letter "e" is used more often than any other letter in the alphabet, therefore it is placed in the largest section and in the most convenient place. All the lower-case letters are arranged with the same idea in mind.

C–Assignment

1. Go to the case given you by the instructor. In this case you will find two or three of each letter in each section.

2. Pick up one letter at a time from each section, study it carefully, put it back where you found it and print the letter on the chart given to you for this purpose. Be careful to mark it in the correct section. The chart is arranged like the California Job Case.

3. After you have filled in every section in the diagram correctly, check with the following list of figures and characters to see if you have left any out:

a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, ; : . - ? ! , ' 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, ff, fi, ffi, fl, ffl, &, $, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z.

4. Check your completed diagram with the teacher's chart and correct any errors that you have made.

5. Now study your chart, and see how many letter combinations you can make that will help you remember where each letter goes. For example, the letters "i" and "s" are side by side and they spell the word "is." There are other combinations; can you find them? If so, put them down on a sheet of paper.

1. When you are sure that you know where each letter belongs ask the instructor for a practice test.

2. Fill out the test sheet and then correct it with the aid of a check sheet furnished by the instructor.

3. Mark your paper and turn it in to the instructor.

B–Assignment

There are other kinds of cases besides the California Job Case which are used by printers for special types of work. If you are interested in knowing what they are, see pages 19 to 24 in *Printing Occupations* by Hague,[1] or pages 26 to 29 in *The Practice of Printing* by Polk.[2]

List names of other cases on a sheet of paper, stating the use of each.

A–Assignment

Think of an original problem that will help you or others in knowing more about the type case. Have the problem approved by the instructor before proceeding.

[1]The Bruce Publishing Co., Milwaukee, Wis.
[2]Guy M. Jones Co., Indianapolis, Indiana.

procedures, etc., whenever possible. Sketches are adequate in most cases, but actual photographs reproduced in halftone cuts should be used where sketches are not clear.

9. The list of *references* should be *specific* and *exhaustive.*

10. If properly developed, the lesson sheet should be *self-administrative* and *self-instructive.* The teacher's time is too valuable to be spent in clerical work and avoidable lecturing.

Conclusion

The methods and techniques described, require a rather complete change in the teacher in regard to basic philosophy and method. The change cannot be put into operation without long hours of preparation devoted to the writing of lesson sheets and in planning classroom procedure. It will also require a type of teacher that has vision and a keen insight into life so that he may be skillful in guiding the pupils in their generalizations.

Typical Lesson Sheet

MACHINE-SHOP PRACTICE

Instruction Sheet — Grinding Tool Bits

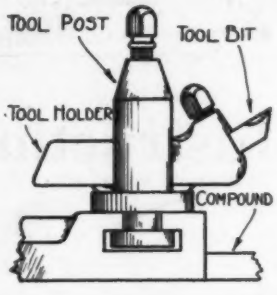
Arranged by F. A. TRUDELL

Purpose: Your success in operating a lathe and shaper will depend to a large extent upon your skill in shaping and grinding tool bits on the tool grinder.

This lesson is written to aid you in learning the correct-shaped tools required to make the various types of cuts, and to develop the necessary skill to grind your own bits.

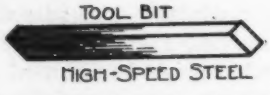
High-Speed Tool Bits

In order to cut cast iron, machine steel, cold-rolled steel, brass, tool steel, and other metals, it is necessary to have a cutting tool that is harder than the metal to be cut. The



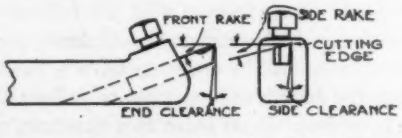
tool used for this purpose is called the tool bit. The ordinary tool bit is made from a special high-speed steel, but many factories now use a special tool manufactured in Germany. This special steel is very expensive and cannot be provided in a school shop.

High-speed-steel tool bits come in small pieces made to fit the toolpost of the various lathes and shapers in common use in machine shops. The sizes provided for your use are as follows:



9-in. lathe — ¼ in. square by 2⅛ in. long.
13-in. lathe — 5/16 in. square by 3 in. long.
15-in. lathe — ⅜ in. square by 4¼ in. long.
16-in. lathe — ⅜ in. square by 3¼ in. long.

The Principle Involved in Cutting Metal with a Tool Bit. The tool bit must be shaped according to some very definite rules or it will not do the work for which it was intended. It will be necessary for you to understand the meaning and



purpose of *top rake, cutting edge, front clearance,* and *side clearance* in order to be able to sharpen tool bits successfully.

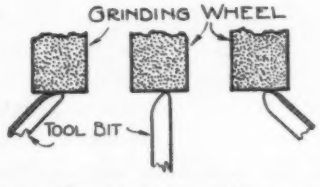
a) The tool bit will not cut unless it has a sharp cutting edge. The shape of this edge will vary according to the type of work which must be done.

b) The top rake is required to give clearance for the shavings that are cut from the work and cause them to curl up in a long spiral. If this is not done, long, sharp, straight shavings that are dangerous to the operator will result.

c) Front and side clearance is required to allow the tip or cutting edge of the tool bit to come in contact with the metal and prevent binding.

How to Sharpen a Tool Bit. Tool grinding appears to be, and is, a very difficult process if the proper methods are not known. If you follow the instructions given herewith, you should experience no difficulty.

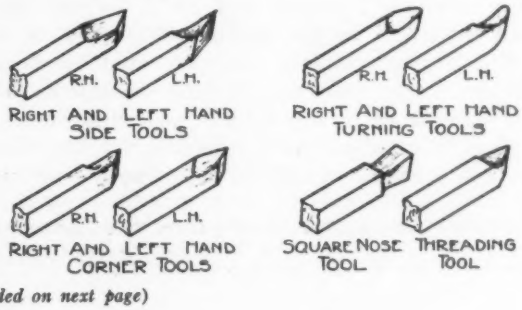
a) The tool bit is ground by holding it against the face of an emery wheel, the bit being held in the hands. It should be held firmly to prevent slipping, but not rigidly enough so that an uneven surface is produced on it.



b) Place the bit against the moving emery wheel and slowly rotate it across the surface of the wheel until the desired shape is obtained. If the bit is held in one position too long, a flat surface will result. You will obtain a better and smoother job if you do not bear too hard against the wheel.

c) After grinding for a short time the bit will become hot. Before this occurs, dip it in water to cool. If this is not done, the temper will be drawn and the bit will become soft or the grain in the steel will become cracked, making it useless for work.

d) Every job requires a cutting tool of a different shape. With a little practice you will be able to shape your tool so as to do satisfactory work. The following paragraph will tell you about the most common shapes used by machinists for work on the lathe.



(Lesson Sheet concluded on next page)

Caution: You are apt to receive serious injury if you grind in a careless manner. In grinding, the small particles of emery are broken from the wheel and fly in all directions at a rapid rate of speed. If they happen to fly into your eye they cause serious injury, inflammation, and often blindness. *Always wear goggles.*

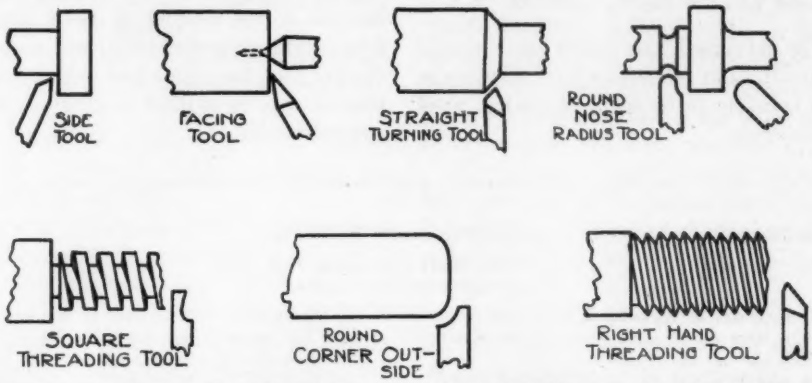
Tool Bits Used for Lathe Work. Lathe tools are made in many shapes for specific types of turning. Experienced machinists learn to make these and many others as they study the results obtained from those they have previously used. By carefully studying the sketches shown below, you will be able to select the type required for your various jobs.

How the Various Tools Are Used. Each of the tools shown is required to be set up in the toolpost in a special way. By the following sketches you will be able to get the best result from your tools.

Suggestions. The following suggestions will aid you in learning more about the grinding and use of tool bits.

a) See the sample tool bits mounted on the panel over the grinder.

b) Practice on a piece of wood shaped like a tool bit before sharpening your first bit. You can obtain a piece from your instructor. Use the special grinding wheel set aside for practice purposes, as wood will quickly fill up the pores in a wheel and make it unsuitable for regular work.



c) The following references will tell you more about how to grind tool bits:

Machine Tool Operation, Burghardt,[1] Chapter III.

Machine Shop Practice, Burghardt,[1] Chapter IX.

[1]McGraw-Hill Book Co., New York City.

The Effect of Tests on Instructional Material[1]

*Roy R. Van Duzee**

GREAT strides have been made in the past 25 years in the selection of subject matter, its organization, and in the methods used in teaching the material in the various types of schools throughout the United States. Along with the inquiries into what to teach and how to teach came the studies which were made to determine how well the subject had been taught. These studies brought out that grades given for work done were of very little help in evaluating instruction, because the marks were based on the standard of the teacher who gave the mark. Each teacher was a law unto himself and there was no scientific basis for judging the quality of instruction.

This condition has been changed in the academic field. The advent of the objective test has made it possible to measure quite accurately what has been achieved in these subjects. Standards of achievement have been set and it is possible to follow the success of the pupil from semester to semester. Not only have tests affected the kind and amount of work done but they have been powerful aids in improving instruction through diagnosing pupil-learning difficulties.

Within the past five years the objective test has extended into the industrial-arts and vocational-education fields, and it is the purpose of this article to discuss the manner in which tests in the vocational field affect the planning, production, and administration of instructional material. There are many phases of the test problem which might be discussed, but this article is going to touch on just a few of them.

For purposes of guidance, counseling, and instruction, the intelligence rating of the student should be known. While it is common knowledge that a pupil with a given I.Q. may succeed in a large number of occupations, there are certain fields in which the odds are so greatly against a person who has a low I.Q. rating, that he should be confronted with the full set of facts. For this reason each teacher should have the I.Q. of each of his students in order to have a basis for interpreting the individual's success or failure. The I.Q. is to be considered in no sense as a determining factor but it does throw light on the pupil's capacity, and no teacher should neglect that type of information or

[1]Address given before the Teacher-Training Group, Vocational Education Section, Wisconsin Teachers' Association, October 31, 1930, Milwaukee, Wis.

*Supervisor of Industrial Arts, West Allis, Wisconsin.

any help that will aid him in doing a better job of teaching. The I.Q. is not merely "interesting data."

Prognostic tests have considerable promise. Teachers would welcome such tests if they were available and valid. Prof. Donald G. Patterson, University of Minnesota, in discussing the Minnesota Mechanical-Ability Tests at the Western Arts Association in May this year, stated that "The intelligence quotient is only slightly related to success in vocational shop courses or to performance in these varied motor-ability and mechanical-ability tests. This conclusion is of the utmost importance for a thoroughgoing program of differentiated education coupled with educational guidance, because it means that many pupils lacking academic aptitude do possess more than average ability in things mechanical, and hence may profit more from shop courses than from strictly academic instruction."

In reporting conclusions on the Minnesota Mechanical-Ability Tests, he said further: "The uniqueness of mechanical ability with respect to abstract intelligence and motor ability and strength cannot be overemphasized. The possibility of salvaging individuals with low I.Q's possessing mechanical ability is so obviously worth following up as to require no further defense.

"Techniques used in evaluating success in shopwork indicate the possibility of improving methods of measuring achievement in shopwork. It is hoped that shop teachers, trained in the techniques of educational measurement, will carry the work forward to the end that reliable achievement-measuring devices in shop subjects may become as widely available as are achievement-measuring devices in arithmetic, spelling, geography, history, etc. These devices may also be used to motivate boys to strive for higher skill in manipulating tools and materials. Similar motivation has resulted from the introduction of definite standards based upon measurement in academic subjects.

"It is hoped that this investigation may play a small rôle in the task of conserving and making effective use of human talents in our industrial society."

Interest in the vocational schools has centered chiefly around the achievement tests. The particular type most commonly used is the locally constructed unit test. The standardized achievement, and the instructional test have been little used. A more extensive use of the objective tests in academic, related information, and laboratory classes will have a salutary effect on the instruction in the vocational schools. Testing has a far-reaching effect on the teaching situation. It clarifies the building of courses of study, the objectives, the content, the methods, and since testing parallels the objectives and content, it is a check on whether the objectives have been realized.

Before considering the effect that the use of the standardized test has on the instruction, let us define it. A standardized test is a test constructed along certain well-known scientific principles for which definite rules for giving and scoring have been prepared, for which definite norms are available, and whose significance and accuracy are known. The standardized test reveals where the class stands with respect to average achievement. Classes below average will be noted by the teacher and supervisor. The test reveals the situation and suitable steps should be taken to remedy the problem if achievement is not satisfactory. It is through this type of test that standards, knowledge, and skills will, no doubt, be developed in the near future in all vocational subjects.

The local achievement test made to cover a unit of work or that of a quarter, semester, or year, is a test made by the local teacher or teachers covering the local course of study. The conditions as to giving and scoring are uniform within the system. No representative norms are provided with this type of test. This test focuses the attention of the teacher on the content of the course and the skills that are to be developed. It, too, is an excellent supervising device, for the supervisor may see from the test questions whether or not the course of study has been taught, and the distribution of scores made by the classes tells how well the teaching has been done. This information should be of benefit in securing better teaching throughout the entire school. Local standards may be set through accumulating scores to make local norms.

In discussing the use of tests with various teachers, I hear this remark frequently made, "The information I find out about my students who have taken a semester or yearly test is of no help to me as they are no longer enrolled." The desire on the part of teachers to know pupil achievement as they go along has led them to devise the so-called instructional tests. The results of these tests show:

1. Achievement in skills and information upon which to base a definite intelligent procedure of teaching.
2. Learning difficulties of students. Determining those parts of the work which need stressing.
3. A record of individual and class program.
4. A basis for determining whether or not a student should proceed to the next unit of work.
5. An objective record upon which marks may be wholly or partially based.

From the standpoint of a scientific check on content, carefully worked out material, adapting the type of question to the abilities being tested, published instructional tests are superior to most of these tests which are made locally. Considering the expense in teacher time, cost of material, the cost of duplication, and the fact that the locally constructed material in most cases is inferior to the published material, it is more satisfactory to purchase published tests.

In conclusion, it may be seen that tests have an important part in planning and operating instruction. They furnish important information about a pupil's ability, are a medium of arriving at standards as to information and skills, show the quality of instruction, provide the basis for an intelligent teaching program and are factors to be considered in assigning grades for work done.

The General Shop

Harold J. Davison and Earl L. Bedell***

THE general-shop idea has been enjoying a great popularity among school administrators. Manual training, as such, is no longer in good standing, and definite vocational training does not seem to belong in junior high schools. Therefore, the general shop is hailed as the means by which a changed situation may be met. Whether or not this proves to be the case, it may be well to consider just what a general shop really is. The following is offered as one point of view concerning the meaning of this shop and the place it holds in relation to the teaching of industrial-arts subjects in our schools.

The Detroit plan of industrial-arts instruction is based upon the use of a general shop. This general shop is merely a workroom equipped in a diversified manner. The term "general shop" is not conceived of as a definite subject of study. Included in each general shop is the equipment necessary for the teaching of a number of related units. The courses which may be taught in these shops are limited only by the equipment and the time which may be allotted to them.

The units that should compose the work given in a general shop are largely dependent upon such factors as: objectives, space, equipment available, community needs, and the administration's policies and inclinations. Because many valuable suggestions pertaining to specifications, standards, and the ways and means of establishing general shops may be found in the current literature on the subject, a discussion of those factors will be omitted.

The courses of study that may be offered in a general shop are dependent upon the equipment in the shop; therefore, is should be determined what course the shop is being equipped to handle. The economical equipping of a shop is dependent upon the courses to be offered. Even though much of the equipment might be identical, it is quite apparent that a shop designed for a course in general metal work would hardly be adequate to handle a course in household mechanics.

The titles of such courses as household mechanics, industrial mechanics, general metal work, farm mechanics, general printing, general woodwork, and general automobile mechanics are indicative of their scope, a scope which is limited only by such factors as stated in the foregoing. Such courses call for a variety of carefully selected, but not a heterogeneous conglomeration of equipment that has been installed with no definite use in mind.

Certain types of subject matter, when organized into courses of study, are best taught in a general shop. This set-up permits the teaching of related fundamentals and the acquiring of related experiences by the boy, in the same room and from the same instructor. Such a situation is conducive to greater freedom and enables the boy to appreciate the interdependability of the units, tools, and equipment involved.

For example, the course in household mechanics, as taught in Detroit, is composed of two main units or divisions, namely, the constructive units and the general repair and maintenance units. The constructive division usually contains a certain amount of constructive benchwork in wood, electrical construction and constructive benchwork in metal. The general repair and maintenance units are largely determined by the needs of the particular community in which the school is located. They ordinarily consist of such units as concrete and plastic materials; furniture repair and carpentry; glass, glazing and windows; paint, varnish and refinishing; plumbing fixture repairs; tool sharpening; and electrical appliance repairs.

It will be noted that the completion of a job in any one of the above units may require the use of and knowledge concerning the equipment in one or more of the other units of study. Because the units in household mechanics are more or less interdependent, the inclusion of experiences in such a variety of units necessarily limits the scope of each unit offered.

The general-shop idea offers much opportunity for experimentation and research. That this idea is a continuously developing one is indicated by the rapidity with which unit courses are being displaced by composite courses which are utilizing the convenient arrangement and equipment of a general shop. No longer are unit courses such as patternmaking, joinery, cabinetmaking or carpentry the vogue. In their stead comes the general woodworking course which is taught in a general woodshop. Unit metal courses have given way to a course in general metal work. This change is particularly noticeable in the junior high schools.

The policy in Detroit is to provide a general shop which includes equipment pertinent to similar or related industrial units. The equipment is selected and arranged to be fully utilized by the boys taking the course for which the shop was provided. It is noteworthy that these courses are not designated in the school catalogs as general-shop courses, but rather as definite courses which are taught in a general shop. Other communities may not choose to select the same units for their general shops, nor to organize their courses in the same manner. But no matter under what plan it is arranged, the general shop has many advantages not offered by a unit shop. The possibilities for teaching organization is one of the many reasons that the general shop deserves considerable attention on the part of persons interested in industrial-arts education.

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**Assistant Director of Vocational Education, Detroit, Michigan.

Providing Effective Shop Training for Apprentices—II

*Robert W. Tarbell**

Instruction Received from Shopmen

As already stated, the trade instruction received by the apprentice in the days of the small shop was in the simple hand processes. The teaching job was in the manual skills. The era of large technical information had not yet arrived. Since the Industrial Revolution, however, rapid changes have been made in the nature of shop practice. Journeymen need a large amount of trade information, which was not needed in the days of the small shop. It is usually a difficult matter to give an apprentice complete instruction in an industrial plant. This sounds a little strange, and yet there are certain reasons why, in a practical situation, the actual instruction may be deficient. These are as follows:

1. The shop organization may be poor. Apprentices may be indentured and then left without sufficient care and instruction to carry them along properly. This may happen very easily if no well-defined organization exists. In the old days almost anyone in the little shop could stop long enough and often enough to give a bit of instruction to the apprentice to start him out on the job. A modern plant is organized from top to bottom as far as production is concerned. Each journeyman has a certain amount of work to do, usually on a piecework or time-slip basis, and has no time to stop to give instruction to an apprentice. If the boy is to receive the proper help, the shop must be organized to give it to him.

2. Following the statements just made, it is readily seen that the speed of production may prevent good teaching. A man who is working on a production basis cannot divide his time and give proper attention to the teaching of apprentices. It is therefore a poor policy to organize the shop with the idea that the instruction will rest heavily on the production men.

3. Frequently there are poorly trained teachers among the journeymen who are assigned to teach apprentices. The fact is that they often have no training at all as a teacher. The fallacy lies in the belief that a good journeyman will, perforce, be a good teacher. Shop management ought to get away from this idea. Efficient methods of instructing apprentices should be the rule, just as efficient methods are applied to production. Certain journeymen should be selected who know the trade and who have the capacity to become apprentice teachers. They should be trained for the job in a thorough manner. The rules of pedagogy apply in the shop the same as in the classroom.

4. Another reason why the shop instruction may be deficient is found in the fact that the shop may not always provide suitable instructional material. The product of the plant may not provide complete training, unless it is very carefully arranged to give apprentices the best possible experience in each phase of the trade. This is a matter to be attended to by a careful organization of the schedule.

5. It would hardly be fair to leave the impression that all these defects in shop training are operating in all shops, and that this type of training is always ineffective. If such were the case, the rising generation of mechanics would indeed be a poor lot. The fact that men trained under these conditions are carrying on the work of industry is an indication of some degree of success. It is safe to say that there are gradations in the quality of the training. Some plants provide a very good program and are doing a fine job, others do mediocre work, and some do poor work.

6. It may be of service at this point to indicate some of the factors that make for a successful program of training in the shop. The ideal plan would essentially contain all the correctives for the deficiencies just discussed. There should be a properly organized plan in the shop for carrying on apprentice instruction. Certain people should be assigned to do certain things at given times. The job of teaching should not be entangled too much with the production schedule. There should be properly trained shop instructors, selected from skilled journeymen, upon whom shall rest the responsibility of teaching these boys. The product of the shop should be carefully analyzed for instructional content, so as to give apprentices the fullest possible trade experience. There should be some means of checking up on the job of training apprentices. The whole process should become as scientific as possible. This is something for industry to be concerned about and is as essential as the other major activities of management.

Limitations of Shop Training

In a sense there are no limitations to the shop training which an apprentice may receive. It is possible to install facilities in the industrial plant to give instruction, not only in the trade processes, but also in all the theoretical branches and social subjects which might be offered in a vocational school. This would mean, however, that space for classrooms must be set aside in the shop, school facilities provided, and instructors secured to do the work. From a practical viewpoint this

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would be an unwarranted expense, especially where there are vocational schools provided from public funds to give the theoretical instruction. This limits the shop quite largely to the business of instructing apprentices in the trade processes and applied information necessary for them to do their work. We should not expect an industrial plant to give all the educational experience needed by an apprentice. Industry is limited rather closely to give training in the trade processes. These are machine and hand skills. It means that the boy will be trained in the operative phases. Shops have little time or facilities for a journeyman to stop all other work while he sits down to give an apprentice instruction in some fundamental things. A certain amount of theory is needed in all trades. The machinist, for instance, learns how to operate the machines, do the benchwork, and assemble parts. This comes as a result of his work in the shop. There is a mass of information concerning all these processes, however, that the expert machinist ought to have. There are many calculations about the work of laying out a job and setting up a machine. Somebody must make these calculations. If the apprentice cannot make them, he must call on someone who can. A proper plan of training would include this theoretical side. For reasons already given, it is difficult to carry on such instruction in the shop. The vocational school is the logical place for this end of the program.

There is another phase to shop training, which is often conspicuous by its absence, but which has a great bearing on the future career of the mechanic. This has to do with the social outlook of the young journeyman. It is very evident to anyone who observes young men in industry that there is frequently a lack of the social experience and point of view, which is so essential to a workman and citizen in a democracy. The absence of this poise and social understanding often results in labor turnover, differences of opinion, and industrial ill will. In recent years some employers have set about to correct this lack, but many have done nothing about it. The shop does not seem to be equipped to give instructional work along this line. The vocational school is the more logical place to develop this part of the program for apprentices.

Journeymen with Shop Training Only

It is easy to express an opinion as to the kind of journeymen made by shop training only. Observation and conferences with others have resulted in the conclusion that this method of training will continue to produce the old kind of "rule of thumb" machine hand or so-called practical mechanic, who can work fairly well as long as no unusual thinking is required. As long as modern industry has so little time to give instruction in the shop mathematics, design, mechanical principles, and general theory of the trade, just so long will apprentices be as ignorant of these things as their fathers are, unless the instruction is received from some other source.

In dealing with a state of training which produces this kind of workmen we are interested in at least three things. In the first place, we want to know how to distinguish the good from the poor. How can we find the difference between the practical mechanic, who is short on theory, and the man who has a more balanced preparation? In the second place, there are people who must be convinced that shop training should be supplemented by theory. There will be people to convince in every department of the plant, from the officials down to the beginning apprentice. Old prejudices will need to be broken down, and this may take considerable time. In the third place, it will be necessary to devise a suitable plan for overcoming the limitations. This means organizing the whole training program. It means a frank recognition of the limitations of shop training and an intelligent procedure for correcting it.

Modern versus Old Methods of Shop Training

In order to make comparisons between an old and a new system of apprentice training, it is necessary to have some objective facts upon which to base conclusions. It is hardly safe to say that times were different in the "good old days," unless we can show specific ways in which they were different. In comparing methods over a period of a decade or two, we should consider the same shop or section of the country. For instance, it would not be correct to compare New York in 1900 with Wisconsin in 1926. The proper way is to use the same locality for each date. We can get a general view of progress in training, however, by citing some of the changes that have taken place in the country at large.

Under the old plan, boys were simply placed to work at the trade. There was no definite agreement as to processes to be taught, hours to be spent in each branch, or wages to be paid. The apprentice was usually advanced according to the circumstances that arose. He might or might not receive a proportionate amount of instruction in the different processes or phases of the trade. Only a few shops had a plan of supervision of apprenticeship. There was very little in the form of a definite policy. Boys were hired to serve a period, usually four years. At the end of that time, they became journeymen. Little attention was given to their training program.

As against this old method, which was quite general up to 1900, we now have an improved procedure in some of the leading states and in individual industries. Some of these things could well be copied in places where they have not already been adopted. They are:

1. Selection of the boy who gives the most promise of succeeding at the trade.
2. An approved form of indenture, signed by the apprentice and the employer, and supervised by the state.
3. A specified time to be spent at each of the different processes of the trade, under competent shop supervision.
4. A specified time to be devoted to instruction in the theory of the trade, on full apprentice pay, under the direction of an approved vocational school.
5. A bonus for the apprentice at the completion of his time.

6. A recognized diploma or certificate, issued by the state, the vocational school, or the industry upon the completion of his time.

A comparison of the old and the new methods shows a distinct advance. Some of these newer ideas are just beginning to take hold in certain parts of the country. They are an indication of what we may expect will transpire in the years to come.

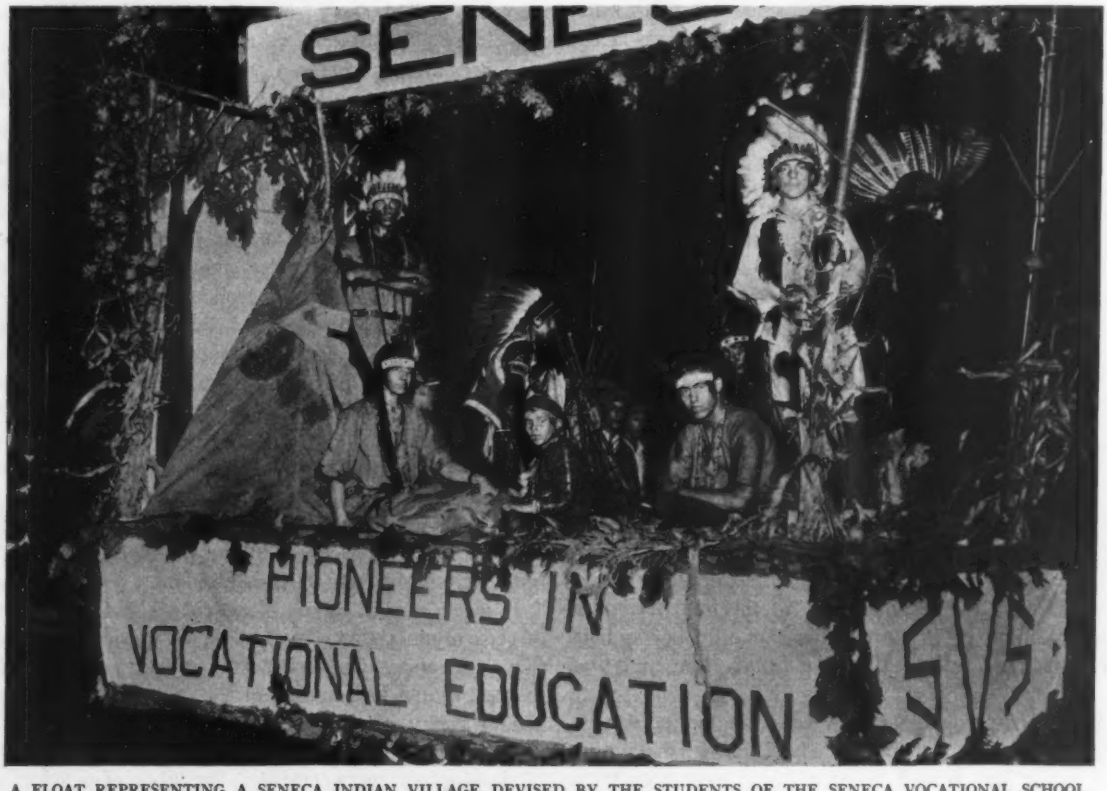
The Responsibility of Industry

Industry can no longer shirk its duty in the program of apprentice training. The job must be done, or we shall slip back in efficiency as an industrial nation. Since industry must be built upon a solid foundation of trade skills and technical knowledge, it behooves industry to be alert and progressive. Industry should be a leader in pushing the program. There are several rather definite things that industry can do in this matter. Scientific studies should be made to find out the real nature of the job. The number of apprentices needed should be determined. The best methods of training should be discovered. Legislation covering apprenticeship training should be fostered in the different states. This will vary according to the needs of the local communities. State laws, when enacted, should be for the upgrading of apprenticeship, as it affects society at large, and not in the interests of a select group. Industries should individually inaugurate an adequate system of training in the plant. This does not need to wait for legislation. It may take some experimenting to find out the best plan of procedure. Such a system should be properly financed to insure its success. There needs to be a well-defined plan of organization to see that it moves along. Industry must see that the personnel in charge of the work has an intelligent understanding of the problems. Finally, the organization is not complete unless the apprentice receives a full round of experience, under the direction of competent instructors.

The various industries of the country should not be satisfied to pursue an individual policy in the apprenticeship program. Just as they group together to establish standards of manufacturing and selling, methods of financing, or to study problems of management, so should they get together in a coöperative way to establish an effective educational program for apprentices. A national body could establish standards and organize the work for the different states and cities. There are increasing signs that such plans are to be inaugurated. Undoubtedly the next few years will see some big advances in this direction.

Some of the ideas put forth in the foregoing may seem a little too advanced. They are not founded on theory entirely. These plans are all in operation to a more or less degree in different places in the country. It is indicative of the progressive spirit in America to do a thing with a will, when the idea once becomes apparent. We can, therefore, look forward with optimism to a high-class system of apprentice education in our industries.

(*Conclusion*)



A FLOAT REPRESENTING A SENECA INDIAN VILLAGE DEVISED BY THE STUDENTS OF THE SENECA VOCATIONAL SCHOOL, BUFFALO, NEW YORK, FOR A HALLOWEEN PARADE

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. METZ, Editor

WHAT AND WHY

"Most shop teachers are unable to justify the courses which they are teaching" — this from a prominent educator who had been spending some time visiting shops in various schools in the Middle West. Another educator from the East expressed about the same opinion.

These two opinions are the reaction of two separate persons and no doubt are the result of generalities drawn from a limited number of experiences, yet they are disquieting.

The average superintendent of schools and the average principal are products largely of academic training. They must depend upon their shop teachers, or upon the local supervisor of industrial-arts work, not only for the industrial-arts course, but also for the philosophy underlying this type of work in the schools. The backgrounds of those in authority usually have not been of the type that will make it safe for them to work out such a philosophy for themselves.

"If, then (and the "if" is used advisedly), the rank and file of shop teachers are unable to give "reasons for the faith that is within them," industrial-arts work is in a precarious position. Of course, there is no reason to view the future pessimistically; nevertheless, if such conditions do exist, one need not wonder why some superintendents and principals are so ready to drop industrial arts at the slightest provocation. It is simply that they themselves do not understand and are not thoroughly sold on the idea, and the teachers with whom they come in contact, unfortunately, belong to those who do not know, or are unable to adequately show, the value of industrial-arts work, and how it can be made to dovetail and enliven the other courses found in the general educational curriculum.

The main objectives of education have been outlined fairly well. Industrial-arts work adequately measures up to a number of these objectives, but this adaptation must be consciously made by the teacher.

There is no more excuse for the shop teacher to be out of step with these general objectives than there is for any of the other teachers in the school system. If industrial-arts work is to occupy the position that it deserves, it is the responsibility of the industrial-arts teachers to place it there. This can only be done if these teachers fully realize their obligation and live up to it.

Many objectives have been set down for industrial-arts work in the elementary school and in the junior and senior high school. Some of them have been very general, others more or less specific. Some of them will be recognized as legitimate by every industrial-arts teacher. The value of others may be questioned. Out of the number that have been formulated, however, may be chosen those that seem to fit the particular likes or needs of each individual teacher. Of course, intelligent choice can be made only after careful scrutiny of the professional literature of the day. After the objectives have been chosen, the task then remains to adjust the work to them. The main thing, however, is that the shop teacher knows where he is going. Without fairly definite reasons for industrial-arts work, the results obtained can only be incidental and mediocre. Work given in a haphazard way will only bring discredit to the movement and little satisfaction and advancement to the teacher. The work has progressed so far the country over, that no shop teacher can afford to belong to the class who teach and know not why they teach.

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NEW-TYPE CLASS ORGANIZATION

With the advent of the larger shop class, came the necessity for more careful shop organization and management, a more carefully arranged division of duties and responsibilities between teacher and student, a more definite scheme for placing blame for things that go amiss, and a more efficient system of assigning duties.

Those teachers who have given the newer method of handling classes a real trial have noticed that a more intensified class pride, an *esprit de corps,* and class loyalty is obtained as a by-product. A study of the newer system of class organization shows why this should happen. Consideration and experience teach that as a person becomes more acquainted with the reason for doing a certain thing and for assuming a definite obligation, he becomes more interested in the activity. When this activity further makes the necessity of coöperating with others plainly apparent; it is quite evident that a more generous feeling of give and take should develop between those who are jointly working toward a common end. Furthermore, with the coöperative striving for a common objective, comes a group feeling of pride not only for the objective gained but also for the fellow workers who fought to attain the same goal.

In industry it happens again and again, that an improvement in an already existing process may produce a change which makes a by-product more valuable even than the object in the production of which it had formerly been but an incident.

It seems that in the development of this newer type of class organization educators have experienced a similar occurrence. If no other thing were gained by this method than a heightening of the group consciousness, the necessity of coöperating with fellow workers, a recognition of the need of assuming responsibility and of developing trustworthiness, the labor of developing

this type of an organization would be well worth while. When, however, the added advantage accrues of having a mechanism at hand which makes the work of teaching more efficient, every teacher ought to at least be willing to probe the possibilities of this newer system.

A QUARTER OF A CENTURY

In the success of human undertakings, time plays an important, although not the most vital, part. There were, however, very few important movements that did not need the maturing effect of time to arrive at their greatest efficiency.

Twenty-five years is not much in the life of a man, and it is still less in the life of an educational movement, yet any project that lives through twenty-five years has demonstrated at least a capacity for future existence and growth, and those who are responsible for it are deserving of praise for at least persistency.

Add to the passage of time, a broad vision, careful planning, a missionary spirit, and the undaunted willingness to surmount obstacles, and twenty-five years really means something more than just a matter of passage of time.

Milwaukee may well be proud of its accomplishment when it celebrates the twenty-fifth anniversary of the establishment of its Boys' Technical High School in the near future. This school was established January 1, 1906, by far-sighted merchants and manufacturers who knew that if Milwaukee wanted well-trained and skillful workmen, it was necessary for someone in that city to shoulder the responsibilty of training them. It was known at that time as the Milwaukee School of Trades, and was operated as a private institution offering courses in patternmaking, machine-shop practice, toolmaking, carpentry and woodwork, plumbing, and electrical work.

The school grew apace, and its founders offered it to the city. Before it could be accepted, a law had to be adopted by the State of Wisconsin to provide for a special tax levy to be raised by the city thus enabling Milwaukee to incorporate the trade school into its city system. It is with considerable pride that this magazine points to the fact that the senior member of the Bruce Publishing Company, William George Bruce, prepared the bill which made it possible for Milwaukee to absorb the trade school in its public-school system.

The success of this school, which has since widened its scope and is now known as the Boy's Technical High School, is the result of a coöperative spirit which does credit to the civic-minded industrial leaders and to the broad-minded educational policies that have caused the passage of twenty-five years in the conduct of this school to mean more than merely a passsage of time.

Men like Charles F. Perry, assistant superintendent in charge of industrial work, who was the first principal of the school, and James L. Cox, who is the present principal, knew how to make the most of this coöperative spirit. It is to their credit that the present Boys' Technical High School has grown from moderate beginnings into an institution which may well serve as a model wherever vocational education is fostered. It is to their credit, also, that the progress made by the school has been continually upward. Their plans made use of time wisely so that it became a vital factor in the development of Milwaukee's vocational-education system. This quarter-century celebration in Milwaukee, then, is of more than local interest. It demonstrates to the entire country what coöperation, planning, and energetic working at the solution of a problem over a protracted period of time will accomplish.

TRAINING FOR LEADERSHIP

The remark is frequently heard that schools should concern themselves more earnestly in training for leadership. There is no escaping the fact that those who will lead in commerce, industry, agriculture, and the professions in the future, whether that be 15, 20, or 50 years hence, are now being educated in one school or another. Are they being trained for leadership, or is the leadership that develops later, something that is inherent in the individual? Many of the leaders of the past had little formal training, yet they became leaders, and many of those who today are directing big enterprises have attended the same school with countless others who will never become leaders.

When the training for leadership is spoken of, is it not equally necessary to bear in mind the necessity for training for the right kind of followership? The best leader at one time or another had to be a follower. It was, no doubt, while he was a follower that he learned how to lead.

In the public schools, where all types of students receive their training, both the aspects of leadership and followership must ever be borne in mind. Necessarily for every leader there must be thousands of followers, hence the aspect of followership, at least numerically, seems to require serious consideration.

Thinking in terms of training for citizenship, for instance, requires that training for both the leader and the follower must be kept in mind, and the real success of the school in producing good citizens depends entirely on how well the dual obligations have been met. Probably the concept of coöperation embracing as it does both the leader and the follower, ought to engross the school's attention more than it does, because training which consciously emphasizes coöperation may come nearest to solving the problem. If every one of the pupils who is now attending school could be given a thorough understanding of what coöperation means, and could be influenced to have a willingness to coöperate in all worth-while endeavors, the country could be at ease as to who would be its future leaders.

Value of Slug-Casting Machines in School Printing Departments

*R. Randolph Karch**

IN considering the advisability of placing a slug-casting machine in the school printing department, it is well first to discuss the purpose of printing education in general.

In the junior high school the objective is to provide experiences for boys so that they can be intelligently guided, both vocationally and educationally. To this end these schools offer the student of printing a practical insight into the elements of the industry, acquaint him with its content, and give him a knowledge of the materials and tools employed.

The senior-high-school shops are either vocational or cultural. The aim of the vocational course is obviously to train the student of printing to take a position in the trade as an advanced apprentice. In the so-called *cultural* printing course, the aim is to present a general education through printing — to acquaint the pupil with the allied industries, to present the information necessary to intelligently buy and plan printing, and to develop a keen sense and appreciation for design, color, and arrangement. The pupil is given a *tryout* in this ancient and important graphic art in both the vocational and prevocational school.

The place of machine composition in the vocational school is almost unanimously agreed upon. As for prevocational schools, many arguments are presented both for and against this addition.

Hand composition must doubtlessly play a great part in the elementary printing course. In the proper manipulation of type, a fair coördination of mind, eye, and hand is achieved. Spelling, punctuation, syllabication and paragraphing are likewise learned "through doing." Method and style are additional factors learned in hand composition.

However, after the fundamentals of assembling type for impressions are learned, the hand setting of straight matter should be set aside. Display composition, the use of white space, balance, proportion, layout, make-up, and other informative lessons in the trade should be stressed. It is not advisable to dwell too long on handwork.

Let us now consider the slug-casting machine in the light of the preceding pedagogical objectives.

First, hand composition is fast becoming passé commercially, and the nondistribution system is the keynote in modern printing establishments. Will hand composition, then, give the pupil "an insight into the industry," when hand composition is admittedly a "lost art"?

Second, machine composition teaches spelling, punctuation, syllabication and paragraphing to a greater extent than does hand composition, because from five to ten times the amount of type is cast, or "set," on the machine. Machine composition, however, does not teach justification, and the exactness of habit

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which goes with it. The operation of the slug-casting machine develops a keen and alert mind, concentration, and gives the operator a good working knowledge of the English language.

Third, there is no tedious and time-wasting distribution. Often the pupils are relieved of the cleaning of higgledy-piggledy type cases. Where no production ties up the type cases, a few pounds in the elementary pupil's cases is sufficient. This creates a saving that may allow the assigning of individual type cases to beginners. The advantage in this is readily seen.

Fourth, as a production aid, the slug-casting machine is a godsend. With a minimum equipment of only two magazines of two-letter matrices, fully 90 per cent of production jobs may be handled. Rulework, newspaper and magazine composition, office forms, all of which are very laborious when hand set, may be quickly and easily produced on such a machine.

Fifth, the pupils are relieved of the "regular job" of setting great masses of straight composition. In this way as much as one fourth of the class time may be saved for more instructive lesson material.

Sixth, new, sharp, clear and clean type is available for all jobs. The ease in handling is another boon. Forms may be recast and run in gangs, thus saving much tedious press feeding by hand. An unlimited supply of border, rules, and spacing material is also found a great help.

The composition data secured in a recent survey of 272 junior-high-school printing departments show that only 41 per cent of these schools hand set the school publication. Twenty seven per cent have all composition done by a trade composition plant. The rest did not attempt any part in the production of the school paper. Why? Many instructors stated on the questionnaire that hand composition was not good trade practice, and therefore not good teaching practice. Incidentally this survey showed that 15 of the 272 junior-high-school printing departments were machine equipped.

Can boys of junior- and senior-high-school age learn to operate a slug-casting machine successfully within a reasonable time, and without undue and expensive breakage? The following facts and figures are presented to prove the practicability of these machines in the school printing department.

When a slug-casting machine was added to the writer's junior-high-school plant, 9A pupils were selected as operators. Each pupil had at least one semester of hand composition as a prerequisite. A week was spent in getting acquainted with the machine. Linotype and intertype lessons from the International Typographical Union Course were studied by the prospective operators. The principle of the circulating matrix and the important parts of the machine were learned. Proper manipulation of the keyboard was practiced.

There being six periods in the school day, six pupils were selected for the first shift. One daily period of approximately 50 minutes was spent on the machine. The daily gain for the first two weeks and also after 50 periods is shown in the accompanying table. As seen, gains in the number of lines set per individual pupil rose from 7 to 26, and then to 44; in the case of student A and student F rose from 20 to 55, and then to 116. In 50 periods an increase in lines of 606 per cent was made by the class as a whole. The table is based on the number of lines set, corrected. Eight-point type was cast, set 13 picas wide. Each pupil set the same copy in the test. The fastest pupil could compose almost 2,300 ems per hour after the 50 periods.

Breakage on the machine for the first semester amounted to $4.75.

It will be noticed that the pupils who had only one semester of elementary hand composition did not do so well on the machine as the pupils with two semesters. This fact, in a way, proves the value of hand composition in elementary courses.

Tabulated Results of Ninth-Grade Students Operating Slug-casting Machines

Pupil	*Sept. 16*	*Sept. 17*	*Sept. 18*	*Sept. 19*	*Sept. 20*	*Sept. 23*	*Sept. 24*	*Sept. 25*	*Sept. 26*	*Sept. 27*	*Nov. 25*	*Sem. Hand Comp.*
A	**7**	12	11	20	19	25	21	22	26	26	**44**	1
B	**16**	19	12	22	23	24	25	26	28	34	**56**	2
C	**6**	16	19	21	27	20	27	30	25	36	**72**	2
D	**17**	17	23	22	32	28	31	35	31	34	**76**	2
E	**11**	19	17	23	23	31	38	45	37	38	**103**	2
F	**20**	31	32	34	36	38	36	36	50	55	**116**	2
Total per cent Errors	11.1	22.0	18.5	14.4	10.5	13.1	10.1	12.4	10.7	9.3	6.6	

The above tabulation is based on the composition of 13-pica lines, 8-point Century Oldstyle, corrected. If a pupil set 10 lines and had 3 errors, he was recorded as having set 7 lines.

VOCATIONAL EDUCATION

There is hardly a community where a knowledge of tools is not worth while. Find out the things people want to know, and then teach it to them. — *Lewis Gustafson.*

VOCATIONAL SELECTION

We should encourage the choice of a vocation at the earliest possible opportunity; any other course will only widen the gap between school and real life. — *L. S. Harding.*

Trade Drawing for the House-Wiring Course

*Joseph Brahdy**

FOR the past eighteen years the writer has taught plan reading and estimating to mechanics of the building trades at the Brooklyn Evening Technical and Trade School. During these years, about 200 electrician's helpers, house-wiring men, and licensed electricians were enrolled in the course at various times. Invariably, their reason for taking the course was to learn how to "lay out the work." They desired to get certain knowledge not obtainable in the shop course, and not readily acquired while they were working on the job. This knowledge of "laying out the work from the plans" comprises the following divisions:

1. How to read architects' plans.
2. How to determine from the dimensions found on the plans the measurements needed for placing the outlets.
3. How to arrange the circuits to meet the requirements indicated in the plans.
4. How to make a layout of the conduits in the plans.

The experience of the writer with the electricians working at the trade who attended evening school to acquire the knowledge needed to lay out work, suggested that it would be desirable to teach this phase of the trade as part of the drawing of the house-wiring course in an industrial high school.

In order to confirm the presumption stated in the foregoing, inquiries were addressed to 102 school officials relative to their findings on the subject matter. Their replies confirmed the presumption that the unit was desirable as general technical drawing.

Analysis of the Trade Practice

Inquiry among the electrician's helpers, house-wiring men, and licensed electricians who attended evening school revealed the fact that these workers could not visualize the circuits clearly from the meager information given on the architect's plans. Plans of small houses show only the outlets, i.e., the positions of fixtures. From this meager information, the wires have to be run to provide the necessary circuits and the desired switching facilities, and to comply with the building code and other regulations. The man who lays out the work on a small building has to think out and visualize all of this directly from the architect's plans.

Large buildings have such a maze of circuits that it is impossible to visualize them in combination, although each circuit is simple in itself. For such buildings, the foreman or superintendent is furnished a layout on special electrical plans showing conduit runs, circuits, etc. From these plans, the work is laid out for the mechanic. In order to advance and to fit himself for a more responsible position, a mechanic must be able to read architects' plans for general information and to lay out work from electrical plans. The electrical plans are skeletonized copies of the architects' drawings, to which is added detailed information for the electrical work. In this case, the conduit runs are thought out for the electrician and he needs only to visualize from the plans how to run the conduits in the building.

The writer analyzed this situation and found that in order to lay out work the following has to be done:

a) For small buildings:
   1. Read architect's plans.
   2. Visualize the circuits from the outlets shown on these plans and from this lay out the conduit runs.

b) For large buildings:
   1*a*. Read architect's plans.
   1*b*. Read the conventional representations used in the layouts on the electrical plans.
   2. Visualize the conduit runs shown on these plans and transfer the layout from the blue prints to the building.

For a small building the laying out is difficult, because it is done by the combination of the following mental operations: The reading of the architect's plans, the visualizing of the circuits, and the mental arrangement of the conduit runs. The conduit runs must then be located on the floors and walls of the building. The layout is done by the foreman and there is little chance for the mechanic to acquire this knowledge, because his time is taken up entirely by the manual operations and he may not even have an opportunity to examine the architect's plans. To learn the laying out from observation, i.e., to pick up this knowledge, is impossible without knowing for each building the mental operations previously mentioned. Should the foreman be willing to initiate mechanics in the laying out, he will find it difficult to do so, because the job is too complex to teach during working hours, particularly in the confusing atmosphere of a building under construction.

In the case of a large building, the operations are performed in the drafting room with the aid of diagrams, and the results are incorporated in the electrical plans of the building. Essentially, the electrical plans are a layout of the conduit runs and there remains only to visualize these runs from the plans in order to lay them out.

To lay out the proper course then, the writer selected a series of architect's plans and graded them according to the difficulty and complexity of the wiring lay-

*Brooklyn, New York.

out. As a preliminary step, the student was instructed in the reading of these plans. The solving of the problem was organized for each job into the following steps:

1. Make a schematic diagram. Thinking is concentrated on making the proper connections.

2. Make a circuit diagram. This is a diagram in elevation in which the outlets are shown at their relative elevation. The thinking in this step is centered on securing the proper circuits.

NOTE: As the student becomes proficient, the two foregoing steps may be combined.

3. Make a circuit layout on an outline copy of the architect's plan. This is a circuit diagram in plan on which the outlets are shown in their actual positions. Here the thinking is concentrated on running the wire between the outlets to fit the conditions of the building.

4. Make a conduit layout on the architect's plans. On this the wires are combined as they are actually grouped when installed in cable ways or conduits. The thinking in this step is concentrated on the practical and economical arrangement of the conduits.

The developing of a certain amount of draftsmanship, although essential to carry out the work, is taught incidentally as the work of the unit progresses.

There is at present but one book on electrical drawing,[1] which the writer believes can serve as a reference book in teaching the unit. Ordinances and generally accepted regulations also will serve as essential reference material.

The redrawing of the most suitable of the collected architectural plans, and the editing of them for the problem work to be done by the students is a formidable undertaking, but it is necessary to get acceptable results.

Since the nature of the unit requires some trade background before it can be taught, the student should have as much shop training as possible before the teaching of the unit is begun. This means that the latter part of the course is the best time for the teaching of the unit.

[1]Calvin C. Bishop, *Electrical Drafting and Design*, McGraw-Hill Book Company, New York City.

Current Comment No. 2

Negative Vocational Counsel

Homer J. Smith*

ONE should not discuss a single phase of a great problem without at least briefly reviewing the assumptions fundamental to the whole field and its present practice. It seems appropriate, therefore, as preface, to outline the justifications of guidance programs, the increasing necessity for organized counsel, and the viewpoint of group and individual advisement.

The democratic ideal of equal opportunity for success cannot be attained except through attention to single cases. American youth cannot be expected to achieve their individual *bests*, whatever these bests may be, without early and constant considerations of their personal futures with the aid of informed and sympathetic elders.

It is probable that much of our so-called social unrest is attributable to the fact that numberless thousands are attempting to work *above* or *below* rather than *at* their natural levels. It may be that vocational maladjustment is more provocative of low morale, at work and at rest, than the odious gap between rich and poor, or between the employer and his workmen. Certainly one does not function smoothly as a social unit if harassed every day and hour by tasks unsuited to his abilities. We may assume with strong confidence that personal content and social upgrading are dependent in large measure upon satisfaction in work.

Likewise, economic efficiency can be hoped for only when most persons do what they can do best by reason of physical, mental, and emotional qualities well matched with job requirements. Greater production, less turnover, reduced waste, and fewer accidents all follow in the wake of proper placement. With these goals before us — individual, social, and economic betterment — we find ourselves engaged in organized attempts at guidance in the schools.

The sweep of the movement has not come because these goals or justifications have only now come to be sensed. There is nothing new about the need and philosophy of guidance. We experience the rising tide because of conditions characteristic of the world of which we are just now a part. We note the increasing multiplicity of vocational opportunities and the minute division of work at all levels. We realize that youth must now choose among thousands rather than dozens or hundreds of occupational types and that parents become less able to help them. We observe the lowering level of average ability in the student body which is borne of increased enrollment, and we see that this means early choices from a widening range of fields and ranks. We know that technological changes erase one job as they create another, and we come to

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feel that the rapid succession of new demands urges broad rather than highly specific preparation.

In the midst of strangeness and confusion, we offer our services to youth — *through study of individuals* for capabilities and deficiencies, *through study of occupations* for opportunities and requirements, and *through schemes of matching* the one with the other. There is no desire here to list the facts most useful to be learned about a person or a field if one would be wise in counsel. Nor is there space merely to name the numerous devices employed in schools to insure that these findings are used together. *We are here concerned with the viewpoint and the logic of the process.*

Giving exact information, by both individual and group methods, is the base and the height of our program. And, with what viewpoint? Shall it be to lead each to a definite goal? I think not. Guidance, to me, is just the opposite for the masses of youth. It is away from things rather than toward them. Those who have succeeded in something would probably have met with equal good fortune in a hundred other endeavors. Just as probably, they would have failed in the few things they somehow avoided. We must attempt to point out to these charges of ours the fields of their probable failure. We must show them the points of unlikeness between what they are and what they have intended. We must disillusion and discourage some youngsters as facts and judgment may dictate.

Much of such assistance can be given to groups and assemblies in a sort of mass prevention. We can warn of crowded professions. We can question parental selections. We can indicate the fields that are interdependent, that place no premium upon initiative, that offer no plans for upgrading, or that present a discriminant factor. We can, even at this stage of the movement, offer factual evidence against some types of employment for certain groups or for youth in general.

Following this mass discouragement, we can be specific with persons. We can dishearten the average and the slow who could pursue long terms of training for certain professional callings. We can ask that the dull and those without strong mechanical aptitude be excluded from the trade and technical institutes or from certain departments within them. We can dissuade those with little musical endowment from heavy expenditure of time and money on that fine specialty. For a boy with little interest and success in mathematics, we can question entrance to training for engineering. *This I call negative counsel. It is guidance away from things rather than toward them. It is a rather easy and fairly certain line of action.*

But this plan is predicated upon each youth's desire to go somewhere or to be something in particular. There is no guidance problem until that stage has been reached. A boy with a bicycle or an automobile has no guidance problem until he is under way, and even then his attention is largely upon avoidance. Let us inspire and encourage and instruct and urge personal choices upon the basis of the best general facts and principles available. After expression of decided interest by an individual in some specific occupation, let us begin search with aim to determine the compatability of the two as lifemates. If comparison be pleasant, we may be thankful, for interest must ever play a stronger rôle in work decisions. But, if comparison reveals anything to preclude the possibility of success, let us be honest, yet sympathetic, in counsel against the union.

It would be a wonderful thing if we could help each youth to select his one and clearly best career. But, there is no such foreordination, and if there were, our task would still be truly tremendous. We shall do well enough if we help each youth, by elimination, to limit the scope of his longings. It must suffice that we can, with comparative ease and certainty, point out some fields that each should not enter and some preparations that each should not attempt. There is a familiar line which reads "Happy is the man who has found his work." It may be added that there is great happiness abroad also because, rather unknowingly, a host of persons have side-stepped the avenues of their probable failure. Let us seek to increase the number through emphasis upon negative counsel.

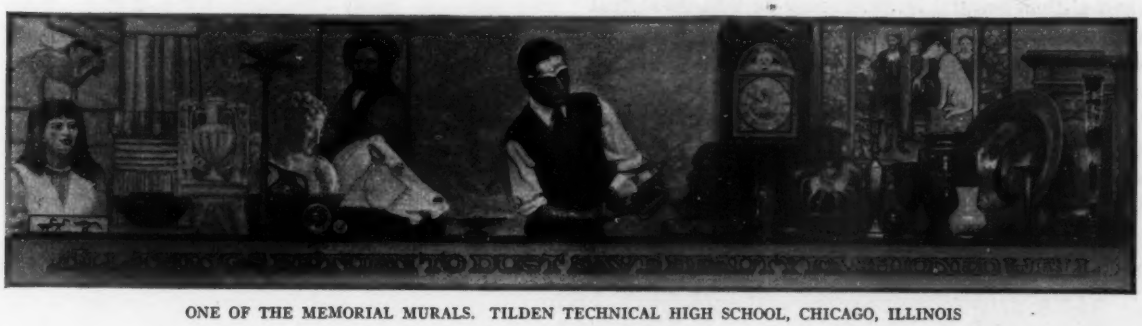
TILDEN TECHNICAL HIGH SCHOOL MEMORIAL MURALS

Mrs. Dorothea H. Davis, Chicago, Illinois

The memorial murals recently dedicated at the Tilden Technical High School were paid out of a fund to which both students and faculty contributed.

These murals are to be a memorial to the young men of Tilden who gave their lives in the world war, and to the teachers who have died while serving the school.

James E. McBurney, a Chicago artist whose murals are favorably known in many cities, was chosen to execute the commission.



ONE OF THE MEMORIAL MURALS. TILDEN TECHNICAL HIGH SCHOOL, CHICAGO, ILLINOIS

PROBLEMS AND PROJECTS

THE MODEL AIRPLANE THAT WON THE WAKEFIELD CUP

By Courtesy of George D. Wanner and Company, Dayton, Ohio

(See Supplement No. 216)

A fellow has to be some model builder to win first place in any event of the A.M.L.A. National contest. To win first place in two events he has to be more than a good model builder, he has to be a supermodel builder, and to win those two events on the same day — well, it can't be done, or at least couldn't until Joe Ehrhardt did it.

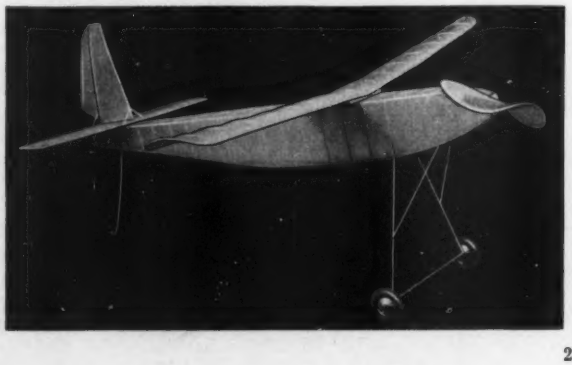
Yes sir! That's just what he did — won first place in both the Stout Outdoor Fuselage contest and the Mulvihill Outdoor Duration contest. Winning the Mulvihill contest gave him a trip to Europe and a chance at the International Wakefield cup.

The Wakefield trophy presented by Sir John Wakefield, England, for International model airplane competition was won for the first time in 1929 by the English. The terms of the gift provide that the contest be held the following year in the country to which the winning contestant belongs. The 1930 competition was again held in England with entries from Holland, Canada, England, and United States.

Every model builder knows the story of how Ehrhardt won the contest with a flight of 155 seconds, 58 seconds more than his closest rival, his flight establishing a new record for models of this type in England.

With such a record it is no wonder that Ehrhardt's winning model was selected as the logical plane for the outdoor fuselage model. At first glance you will probably say the model is queer-looking. This we will not deny, but the model was not selected for its looks but because of its excellent performance. On looking at it closer, you will see that it isn't so queer after all. To be sure, the high landing gear and the long tail skid do not just fit in with our present conception of airplane design; but remember, this is a model powered with rubber, and that 17-in. propeller isn't on there just for nothing. The high landing gear gives the propeller plenty of clearance, and what is more important, gives it an extremely low center of gravity. It takes more than a gust of wind to upset this model. Ehrhardt got his weight where he wanted it to give him a maximum amount of stability.

There was a strong wind blowing, during both the National and International contests. Lighter models and models with less stability were tossed about and broken almost as fast as their builders could bring them out of their boxes.



Furthermore, the plane fulfills all the requirements of both the Stout Fuselage and Wakefield contests. It has a wing area just over the 125-in. limit and the maximum cross section of the fuselage is slightly more than 9 square inches, the required area for a 30-in. fuselage.

If you want a real sturdy, long-flying fuselage model for your airplane club, let them build a duplicate of Ehrhardt's champion and win some contests. Here is a list of materials you'll need to build this plane:

4 pc.	1/8 x 1/8 x 30	Balsa Longerons
15 pc.	1/16 x 1/16 x 18	Balsa Bulkheads
3 pc.	3/32 x 3/32 x 18	Balsa Bulkheads
3 pc.	1/32 x 1 x 18	Balsa Rib Stock
2 pc.	1/16 x 3/16 x 18	Balsa Wing Spars — Front
2 pc.	1/16 x 1/8 x 18	Balsa Wing Spars — Rear
2 pc.	1/16 x 1/8 x 18	Balsa Trailing Edges
3 pc.	1/8 x 1/8 x 18	Balsa Leading Edge Wing and Stabilizer
1 pc.	7/8 x 1 1/2 x 17	Propeller Block
1 pc.	1/2 x 1 x 4	Balsa for Front and Rear Plugs
1 pc.	1/16 x 1/4 x 18	Balsa Stabilizer Spar
1 pc.	1/16 x 1/8 x 18	Trailing Edge for Stabilizer
2 pc.	1/16 x 1/4 x 15	Bamboo
2	2-in. aluminum disk rubber-tired wheels	
1	6-in. length .032 music wire for propeller shaft and rear hook	
2	3/16 flat brass washers	
3	sheets Japanese tissue	
1	large tube Wanner's cement	
1	can banana oil	
25	feet 1/8 x 30 rubber motor	

Let us begin with the fuselage. The drawing shows the top, side, and bottom panels. The two side panels are just alike, except one is right and the other is left. The top panel is wider and flatter than the bottom panel. Notice that, with the exception of the four front bulkheads which are of 3/32 by 3/32-in. balsa, all the bulkheads are cut from 1/16-in. square stock. The four main longerons are 1/8-in. square balsa.

The easiest way to build the fuselage is by the pattern method. The kit contains full-sized drawings of the four fuselage panels, top, bottom, and sides. These drawings show each spar in its proper place. If you are working without a kit, you should make your own drawings in ink. A sheet of wax paper is laid over the drawing and then a sheet of Japanese paper over this. Since the drawing is of ink, it is readily discernible through both sheets. The panels are then built up on the drawing following the lines as a guide to obtain the correct shape. Pins are used to hold the spars in place while the cement dries. Some model builders prefer to cover the fuselage after it has been assembled. In this case, the Japanese tissue and wax paper are not used over the drawing. Otherwise, the method of assembling is practically the same.

Let us begin by assuming that the side-panel drawing is laid out on the workbench, covered first with wax paper to keep the cement from sticking to the drawing, and then with the Japanese tissue. Press pins into the bench through the drawing following the lines of the longerons (see Fig. 2). Paint one side of the 1/8 by 1/8 by 30-in. longerons with banana oil and lay them between the pins on the drawing, painted

side down. Now, with a razor blade, cut the cross members to length. Notice that the first four bulkheads in the front of the fuselage are constructed of 3/32-in. square balsa, while the balance are of 1/16-in. square stock. The two end bulkheads, front and rear, fit against the ends of the longerons instead of between them, as in the case of the others. As each piece is fitted, one side is painted with banana oil, and the ends with cement, and the piece laid in place on the drawing. When all the crosspieces are in place, go over the end joints with cement to insure a strong joint. Allow the cement to dry at least three hours before removing the pins and trimming the paper.

Remember that, although both sides are identical, the paper is on opposite sides of the frame and therefore a right and a left drawing of each panel is required for assembling.

When the two side panels are finished, place them on their top edge over the drawing of the top panel (Fig. 3). Next, cut the top crosspieces to fit between the longerons. Cut these to the length shown by the drawing and then fit the pieces between the longerons, being sure to line them up with the corresponding pieces on the side panels. As soon as the crosspieces on the toppieces have thoroughly dried, add the crosspieces for the bottom panel. This can be done without removing the fuselage from the board. It will be necessary to wedge the two edges closer together, as the bottom of the fuselage is smaller than the top. A piece of string looped about the fuselage will pull it into position while the cement dries.

Next, cover the top and bottom panels. This can be best done by cutting the paper to the approximate size and then laying it in place, the spars and longerons having been first painted with banana oil. When dry, all the edges of the paper are trimmed off and the job completed by giving the remaining edges a coat of banana oil to fasten them down.

The fuselage, like the wing, is doped to shrink and glaze the paper. Banana oil thinned with acetone makes an excellent dope and at the same time waterproofs the surface. As a rule, the mixture is 5 parts of acetone to 1 part banana oil, but this can be varied to suit the job.

Figure 2 shows the size and shape of the landing gear. The long main strut is a piece of 1/16 by 1/16 by 8¾-in. bamboo. Notice how it is bent to conform to the side of the fuselage. Bamboo is quite pliable when heated to just below the charring point. An electric soldering iron makes an excellent tool for bending bamboo. Uniform shapes can be obtained for both halves by bending a piece 1/16 by ⅛ by 8¾ in. and then splitting it into two pieces. The axles are one piece of bamboo 1/16 in. square. Note how the wheels are kept in place by bending the end of the axle. This is done after the wheels are assembled. The front strut or brace is made from a piece of bamboo, 1/16 by ⅛ by 6 in., bent to shape and split for the two sides.

When assembling the struts to the fuselage, scrape off the paper from the cross braces at the point of contact. A much stronger joint will be obtained if the bamboo is cemented directly to the wood. Notice that the main strut is fastened to the axle by means of a small wire bent about the strut and along the axle.

The tail skit is made of one piece of bamboo, 1/16 by 1/16 in. The drawing shows its location and shape. Notice that it is cemented to the left longeron rather than to the center of the bottom crosspieces.

The model has a double-surface built-up wing. Notice the high camber both on the upper and lower surface. Ehrhardt says that he does not have much faith in sections platted for large airplanes. His idea is that the slowest speed that an airfoil is tested at (about 35 m.p.h.) is much faster than a model ever flies. Therefore the conditions under which they are performing is entirely different, and an airfoil suitable for one is not suitable for the other. He tried to imitate the curve found on the wings of large birds, as their normal flying speed more nearly approaches that of the model.

The small sketch to the right of Figure 4 shows the method used in assembling the wing. Notice that the ribs are almost cut in two where they fit over the spars. If both sides of the slot are well cemented, this will not weaken the rib.

Fifteen ribs, each identical, are required. It is of utmost importance that the slots in each rib correspond. There are four main spars used: the leading edge, front internal, rear internal, and trailing edge. Assemble all the ribs on the two internal spars. A full-sized drawing of the wing used as a pattern will simplify the work. When every rib is in its exact position, cement them in place and allow them to dry. Next, the ⅛-in. leading edge is cemented in place. This can be roughed to the required shape and then finished after it has dried in place, or it may be completely finished after it is assembled. Sandpaper on a small block will do the job. Care must be taken to maintain the wing curve as much as possible. The trailing edge is next added. This is made from a 1/16 by ⅛ by 18-in. balsa spar. After assembling, sand to shape.

Next, add the tips. These are bent from a piece of 1/32 by 1/16-in. bamboo which is split to form two tips identical in shape and size.

This completes the two halves of the frame. They are assembled by butt jointing the four spars, the last or center rib being cemented into place at this time. While the cement is drying, one half of the wing must rest on the workbench and the other half must be raised near the tip by resting on a block or pile of books to give the required dihedral angle.

Additional strength is given to the wing at the center by the addition of a small balsa block cut to fit the angle formed by the two halves. This block is made from ⅛ by ⅜ by 4-in. balsa. It also serves to raise the leading edge of the wing ⅛ in. higher than the trailing edge. This gives us a slight angle of incidence. The trailing edge is supported by two small V blocks cemented to form a level surface. The trailing and leading edge blocks also give us a flat surface on the lower surface of the wing where it rests on the fuselage.

The wing is covered one half at a time. Since the lower surface has a decided camber, it will be well to cover it first. Cut the paper to the approximate size, lay the end across the center rib and paint with banana oil. Let the paper lie naturally in place, smooth out all wrinkles and see that it is lying flat on the curve of the ribs. Now, with a fine-pointed brush, paint the top edge of each rib and spar with banana oil through the paper. Do not attempt to lift the paper to paint the rib direct once it is set in place. The banana oil will soak through the paper and stick to the rib. This method does away with any possibilities of wrinkles. Next, trim the paper to size, paint any remaining edges down with banana oil. The upper halves of the wing are covered in the same manner. Since the curve is convex, it is much less difficult.

When finished, the entire wing is doped in the same manner as used with the fuselage. The paper on a neatly covered wing will be as tight as a drum after one or two coats of dope. The dope also serves to reduce drag, glazes and waterproofs the surface, and in general improves the appearance and performance of the wing.

The stabilizer is constructed and covered in much the same manner as the wing. Instead of two internal spars, it has only one, which is 1/16 by ¼ in. in size. The ribs are all cut off and butt jointed to the spar. A streamline section is used, that is, it has the same shape on both surfaces and is designed to pass through the air with the minimum amount of resistance. It gives practically no lift. Notice that the stabilizer does not have any dihedral angle. Two small pieces are cemented to the leading and trailing edges where they rest on the fuselage. The trailing edge block is approximately ⅛ in. higher than the one on the leading edge. This gives the stabilizer a negative angle of incidence. Joe says a negative ¾-deg. angle is about right.

Ehrhardt cemented his stabilizer to the fuselage before each flight, cutting it off by splitting the two incidence blocks across their centers. He did this so that the model would fit

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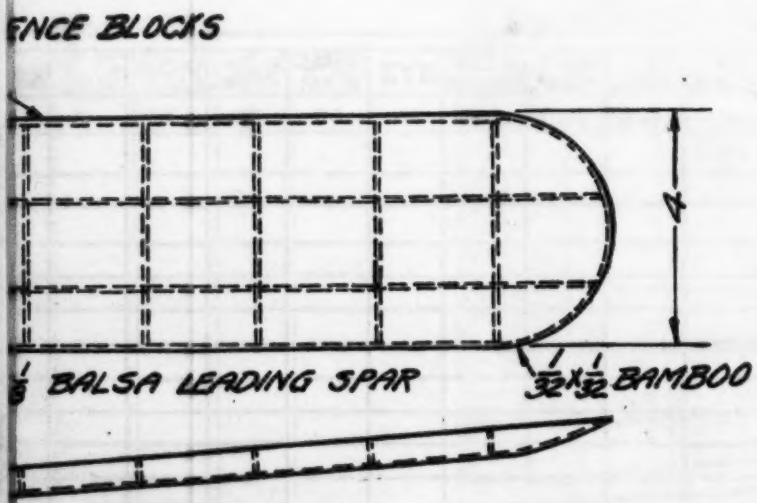


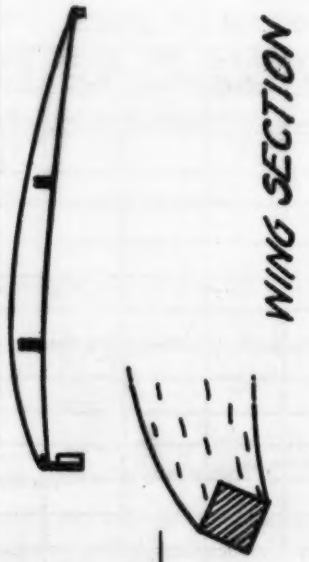
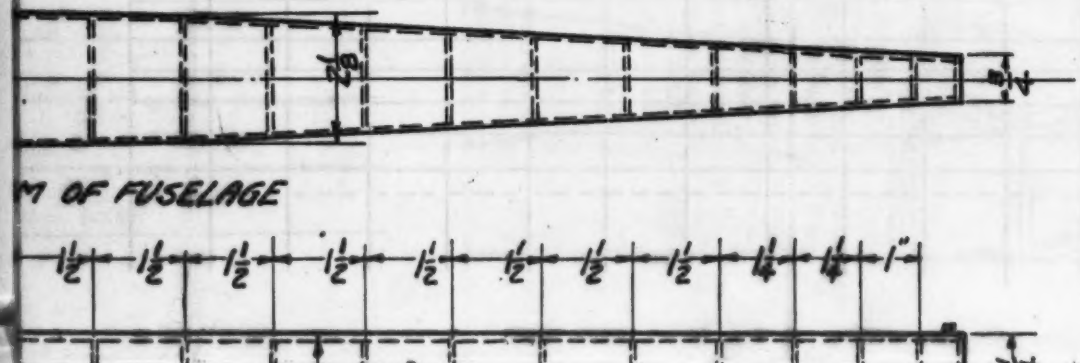
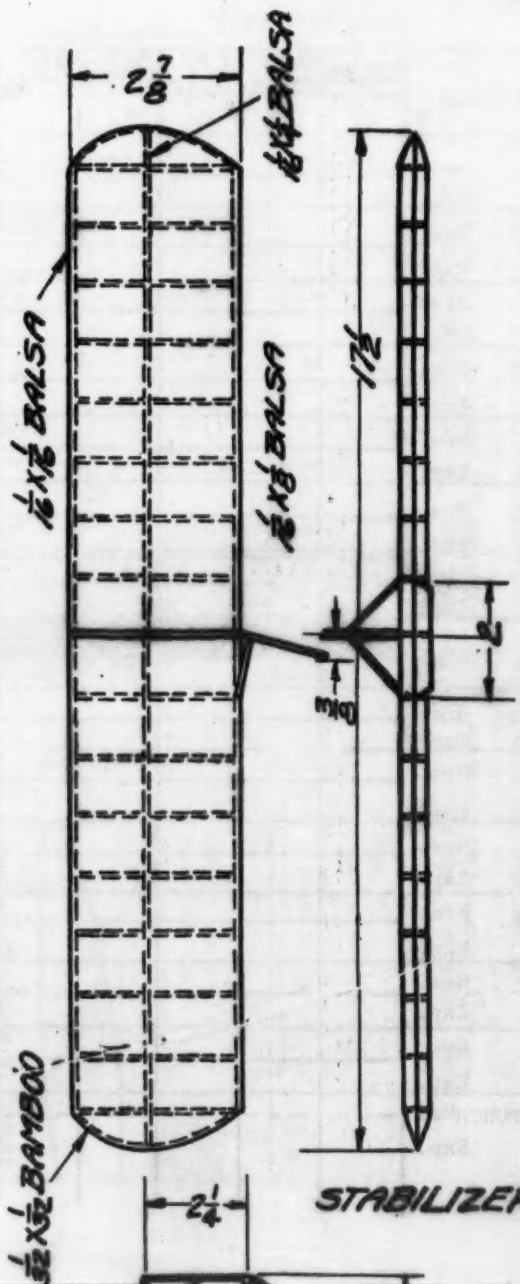


FIG. 3





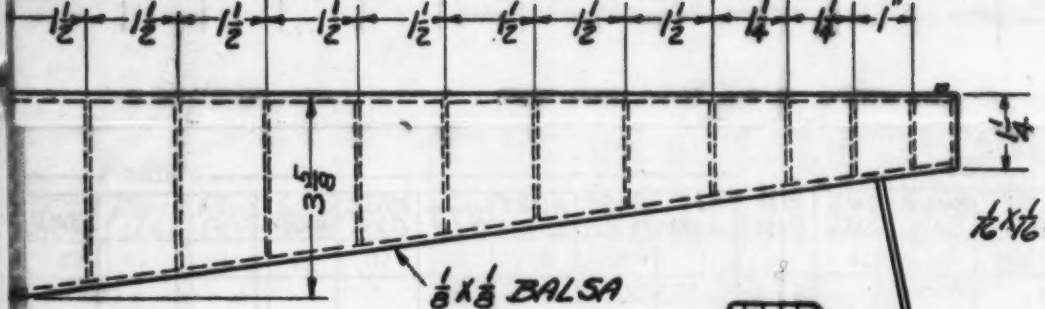
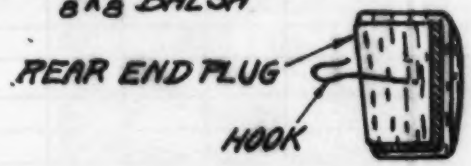
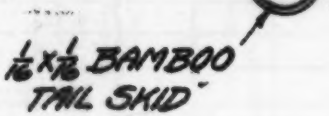
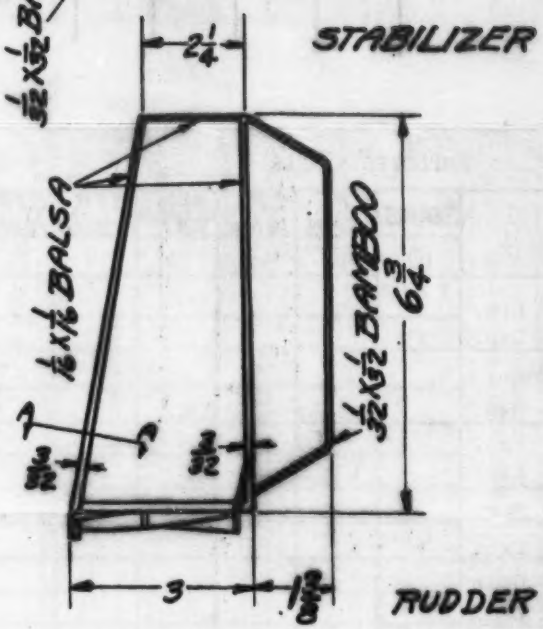


FIG. 2



FUSELAGE ASSEMBLY





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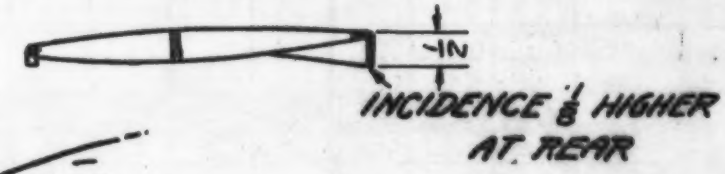

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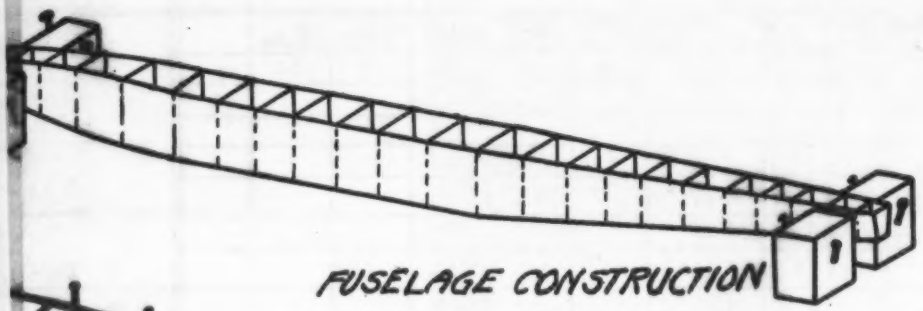
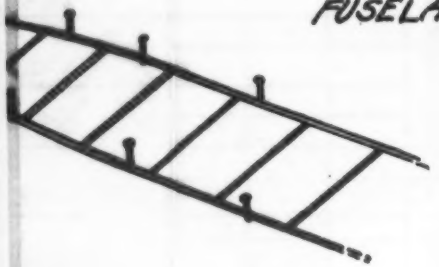
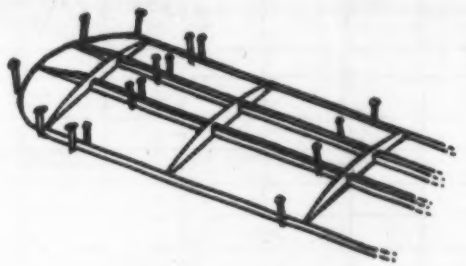


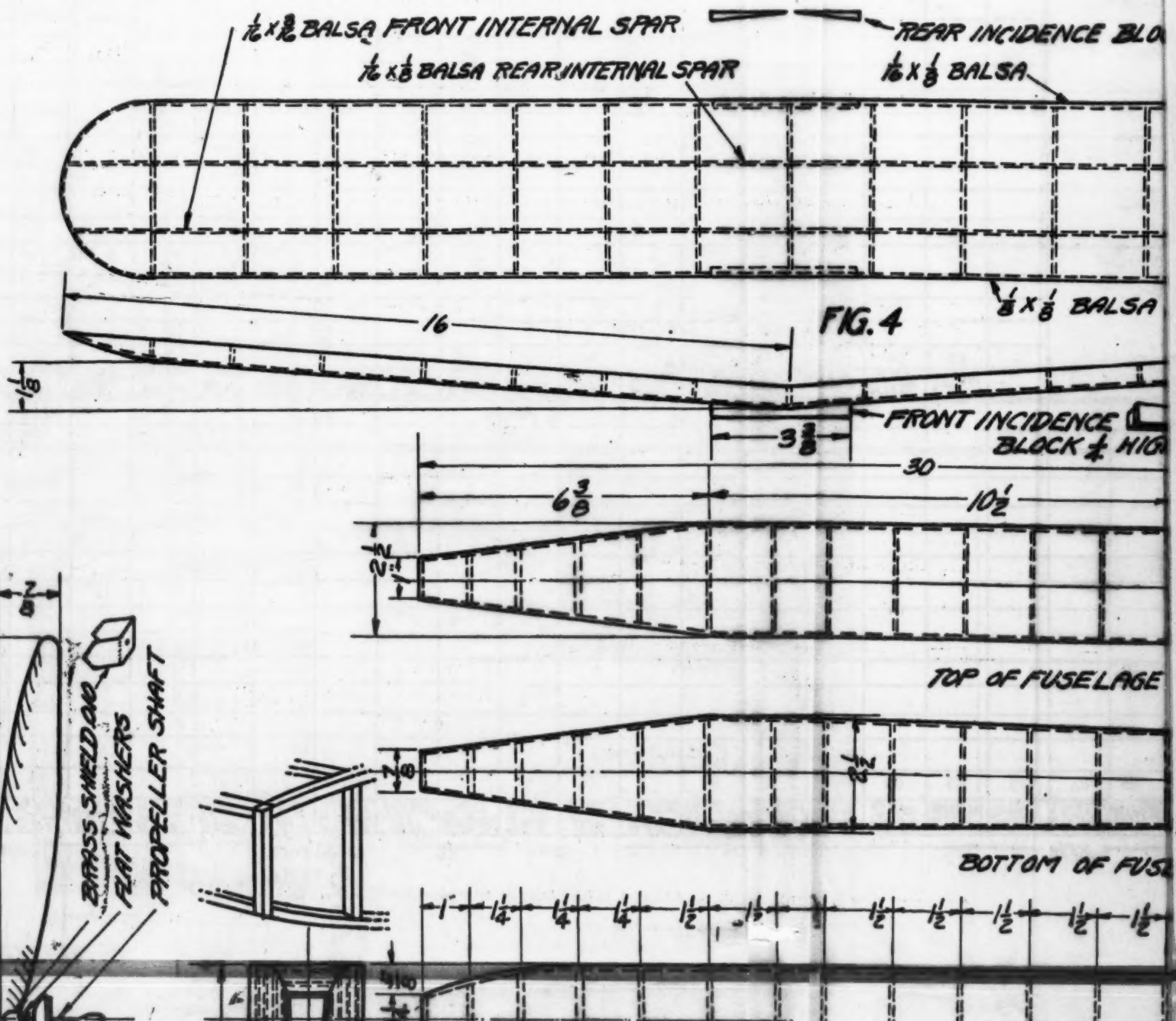
FUSELAGE CONSTRUCTION





WING CONSTRUCTION

Described Elsewhere in This Issue


1/16 x 3/16 BALSA FRONT INTERNAL SPAR
1/16 x 1/8 BALSA REAR INTERNAL SPAR
REAR INCIDENCE BLO
1/16 x 1/8 BALSA
1/8 x 1/8 BALSA
16
1/8
3 3/8
FRONT INCIDENCE
BLOCK 1/4 HIG
30
6 3/8
10 1/2
2 1/2
TOP OF FUSELAGE
1/8
2 1/2
BOTTOM OF FUS
1
1 1/4
1 1/4
1 1/4
1 1/2
1 1/2
1 1/2
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7/8
BRASS SHELDAU
FLAT WASHERS
PROPELLER SHAFT
9/16

FIG. 4

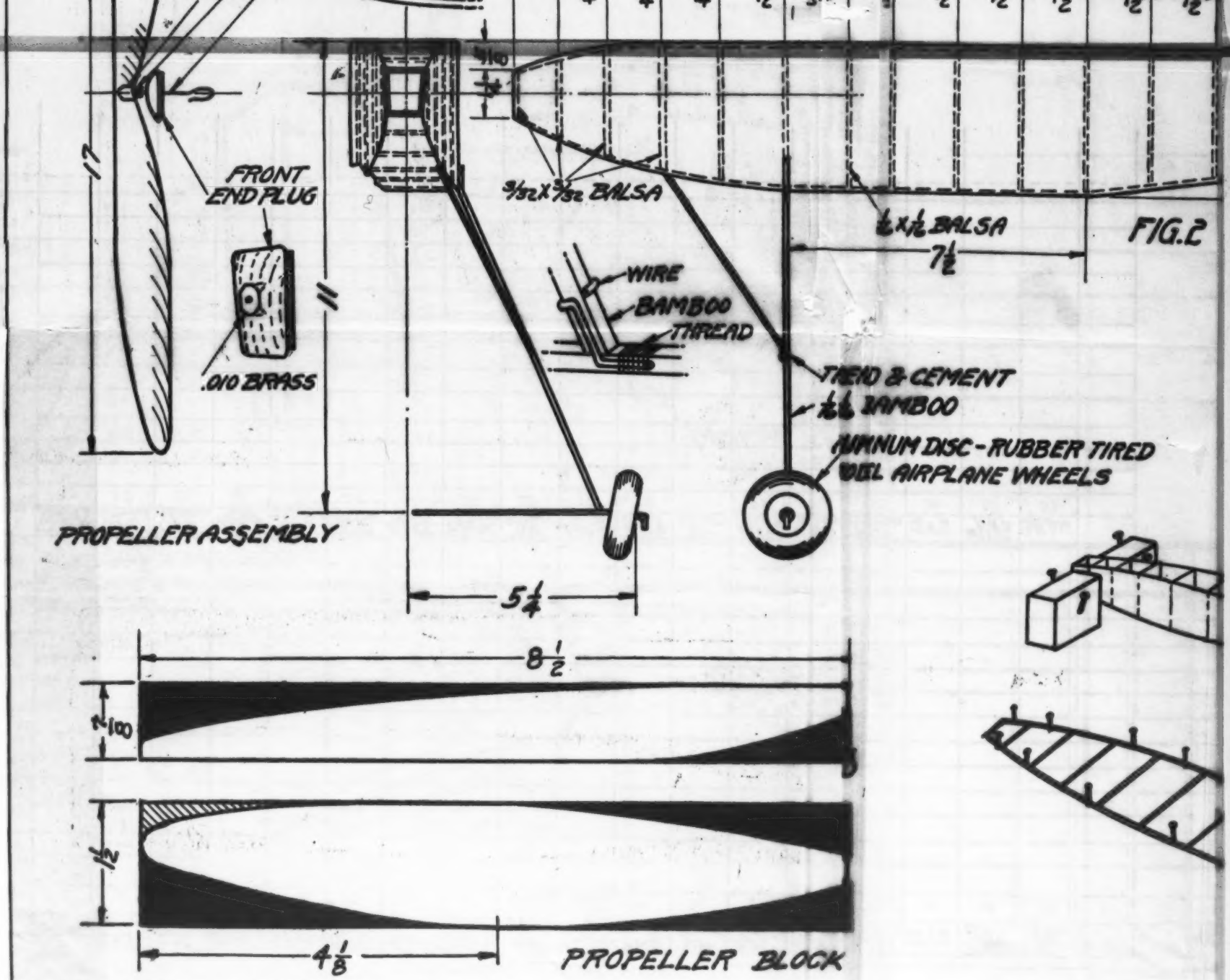


FIG. 2

Designed by Joseph Ehrhardt, Winner of the Wakefield Trophy

into his carrying case. Small wire clips with rubber bands running underneath the fuselage would make a much neater and workmanlike job. This is the same method used to attach the wings on twin pushers.

A single-surface rudder is used on the plane. This can be built by the pattern plan over a full-sized drawing. Ehrhardt covered his with paper that had been shrunk and doped before using. Paper may be doped by pinning it in a frame until doped and dry. Joe feels that this prevented the paper from warping the rudder frame. Notice that the rear part of the rudder is formed from a bamboo piece. This was done so the rudder could be bent if it was desirable to have the model fly in circles.

The rudder is cemented in place on the stabilizer and braced by four small 1/32 by 1/32 bamboo pieces (see the drawing).

The propeller is carved from a ⅞ by 1½ by 17-in. propeller block. The two sketches show how Ehrhardt carved his blade. First the block was laid out as shown. The black part was cut away before the carving of the blade was started. Then the blade was shaped following the two edges of the blocks as a guide instead of the diagonals, as in the more conventional method. The partly shaded part was cut away after the blades were entirely finished. This method is more difficult than the diagonal method.

The propeller hub is backed by a small piece of brass to prevent the washers from cutting into the wood. A small flat piece is also cemented to the nose plug for the same reason.

Notice that both the nose plug and the rear plug are carved from solid balsa to fit the end of the model. The drawing shows the details plain enough so that they require no additional explanation.

The wing is held in place on the model by small rubber bands looped over the wing and under the fuselage and back over the wing. In windy weather a silk thread is tied to the tips and extends under the fuselage. This prevents the wind from folding the wing back.

Notice that Wanner's No. 3 rubber-tired, aluminum disk wheels are used on the model. Ehrhardt gives considerable credit to the use of this type of wheel for the performance of his model. He points out that their weight is such that the entire center of gravity is lowered to the point where he receives a positive pendulum action which tends to stabilize his plane in flight. It would be a serious mistake to replace these with a lighter wheel.

The plane is powered with 10 strands of ⅛–30 rubber. Joe says he gave the motor 1150 to 1200 turns on his winning Wakefield flight.

After you have your model built, go out after Joe's record. Write in to the Airplane Model League of America, Dayton, Ohio, and tell us about your experiences. Most of all, start now to get ready for the big National contest. Get your model tuned up and come to Detroit and win some model contests.

LEATHER CRAFT IN THE SUMMER CAMP

Stephen Henry Hurtuk, Head Auto-Mechanics Department, Collinwood High School, Cleveland, Ohio, and Supervisor Arts and Crafts, Cedar Crest Camp for Boys, Oakland, Maine

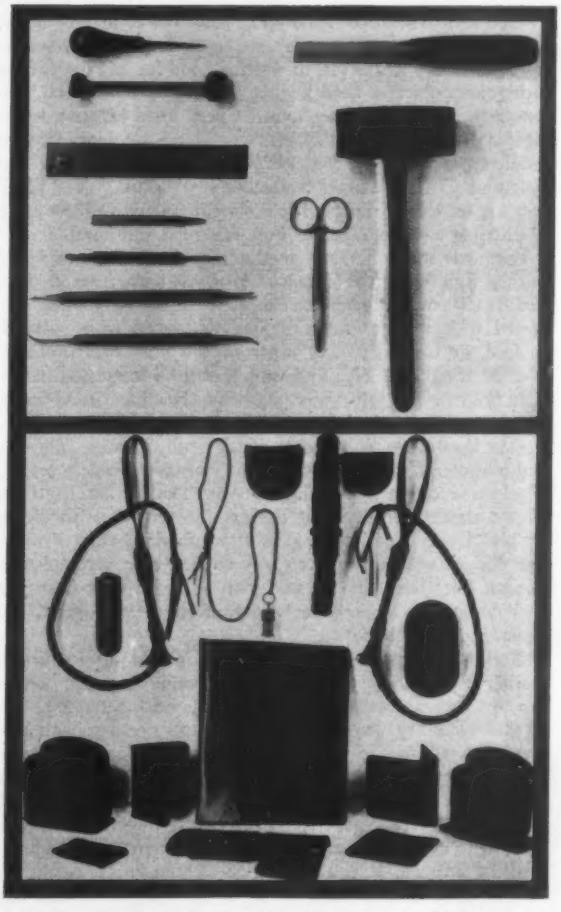
With the unmistakable signs of the approach of summer, large numbers of teachers who spend their vacation period acting as counselors or serving in some other capacity in summer camps for boys, girls, or adults, will now be making plans in order that the particular type of work for which they are to be responsible will give as much pleasure and satisfaction and meet with as large a measure of success as possible. The counselor who gives some thought to the arrangement, content, and intelligent planning of his program before the actual opening of camp will insure a more pleasant summer for himself and those for whom he is to be responsible.

Camp workers have found that a handicraft activity is essential in building up a well-balanced program, and the camp that provides a place for such constructive occupation, where placed on a schedule or offered as free-time work, goes a long way toward holding the interest of both the older and the younger boys.

This article is therefore addressed particularly to those counselors who are to be in charge of the arts and crafts activities of the camp. If leather craft has not already been included as one of the phases of this work, it is strongly urged that it be given a place in the program this summer. The writer has for the past four years been directing the arts and crafts work at Cedar Crest Camp for Boys at Oakland, Maine, and each year finds craftwork in leather growing increasingly popular among the 100 boys enrolled there for the summer.

Leather craft, or the art of making beautiful things from leather, is one of the oldest and most fascinating of all crafts. In olden times leather was a necessity, and so we find it today. It is one of the few materials for which there is no satisfactory substitute. Leather-craft work is readily adapted to the age and skill of the individual, making it an ideal craft for use among large groups with wide divergence of ages. Then, too, it requires very little equipment.

In the presentation of leather work to a group, the projects selected to arouse curiosity and hold interest must give in-



TOP—Necessary construction tools for leather craft. Reading from top left: Fid, machine hammer, anvil punch, tracer, modeler, knife, mallet, scissors.

BOTTOM—Leather craft articles constructed by Cedar Crest camp boys (ages ranging from 6 to 23 years).

struction in the elements and fundamental principles of leather working. It should be remembered that each project presented has a definite value, and fits into the program planned to contribute to the general knowledge the workers are to receive from the presentation. During the presentation or demonstration the work should be clearly shown step by step, also the method of handling all tools.

If an older group of boys is to be instructed, they will be interested in getting as many of the principles as possible during the period of instruction, and will voluntarily prolong the period. The demonstration period may be followed by a period for individual instruction, using scrap leather. The younger-boy group will be slower to grasp the elementary principles. This group will want to try out the tools and inspect finished work and materials. The leader must proceed more slowly in directing the attention of this group to the elements and principles of leather work. In all cases, practice with remnants and scrap leather should be required until the necessary steps are mastered, and at no time should an individual be permitted to attempt to make an article beyond his skill.

The real beauty of the finished article is the leather itself, and the first concern is the leather to be used. No amount of elaborate decoration can offset inferior quality, therefore buy good leather even for a small project. Some leathers which are best for one purpose are not at all satisfactory for another. Some study should be given the properties and adaptability of the various leathers.

In the construction of projects, the correct way is to proceed with a pattern. A project that is to become a neatly finished article must be made up of parts cut to fit accurately. Without a pattern, when the cutting is done by guesswork, the unnecessary risk is run of wasting good leather and getting such disappointing results that the worker will be discouraged. It is possible to obtain, at very small expense, working patterns plotted by experts on which are marked very definitely each step in construction. Workers desiring to plot their own patterns should remember that accuracy and precision are essential. Each article should be so planned as to be pleasing in appearance as well as strong and durable.

There are many different methods of decorating articles of leather, but even the simplest type of decoration is very effective if carefully done. The article may be tooled, decorated with background stamping, decorated with cutwork, colored, or treated in any other of the numerous processes of decorating. The advanced worker will be interested in embossing, inlaying with wax, coloring, beading, using metal ornaments, etc. The design is the most important feature of leather decoration and should be carefully chosen. The size and purpose of the article should be considered before making a selection of an appropriate design. The leather itself has such a natural beauty that designs for this work should be simple. A very pleasing effect is often obtained from straight-line designs which are more easily applied than a complicated design. For those who do not wish to make their own original designs, it is possible to obtain for a very small sum designs already made up.

Braids, weaves, and knots are an interesting feature of leather work and very useful in making handles, whistle lanyards, quirts, watch fobs, hat cords, waist belts, etc.

The necessary construction tools illustrated herewith have been limited to the smallest number possible. Later, when more elaborate work is contemplated, additional tools may be secured. Some of these tools are doubtless already among those in the camp shop. Referring to the illustration: the fid is used to enlarge a punch hole and make room for the lacing to pass through. It is also used to tighten knots, lacing, etc.

The machine hammer and anvil are used to attach snap buttons.

The punch is used with the mallet to punch holes for laces, buckles, etc.

The tracer is used for transferring designs to the leather and deepening outlines in tooling.

The modelers are used for all types of tooling. They are used in outline creasing, outline cutting, for depressing backgrounds, etc. They are the most important tools for all types of tooling.

The knife, a "shoe knife," should be especially reserved for leather work and must be kept very sharp.

The mallet, which is made of wood, is used for striking the punch, for flattening seams, etc.

The scissors are for general use in cutting patterns, etc.

Included in this equipment also should be an oilstone for keeping knife and edge tools sharp, and a cutting and punching board used for cutting leather to pattern and punching holes. This board should be of hard wood, preferably maple, about ⅞ by 10 by 16 in.

The cost of a leather-craft program need not be great, in fact, a very satisfactory program may be initiated with a very small outlay of money. One satisfactory method of financing a leather-craft program has been found to secure or create a fund sufficient for the initial outlay for tools and a minimum stock of materials. This becomes a revolving fund as the finished articles are sold, and should be used for restocking materials. A rule requiring payment for all items before work is started will save misunderstanding. In most cases the camp director can be persuaded to create the fund necessary to put the project into operation, after which it pays its own way.

Some of the articles found most popular among our Cedar Crest Camp boys were: waist belts, riding quirts, coin purses, whistle lanyards, ladies' purses (for sister or mother), book ends, bill folds, book covers, etc., some of which may be seen in the accompanying illustration. These articles shown were constructed with the tools illustrated.

REVOLVING BOOKSTAND

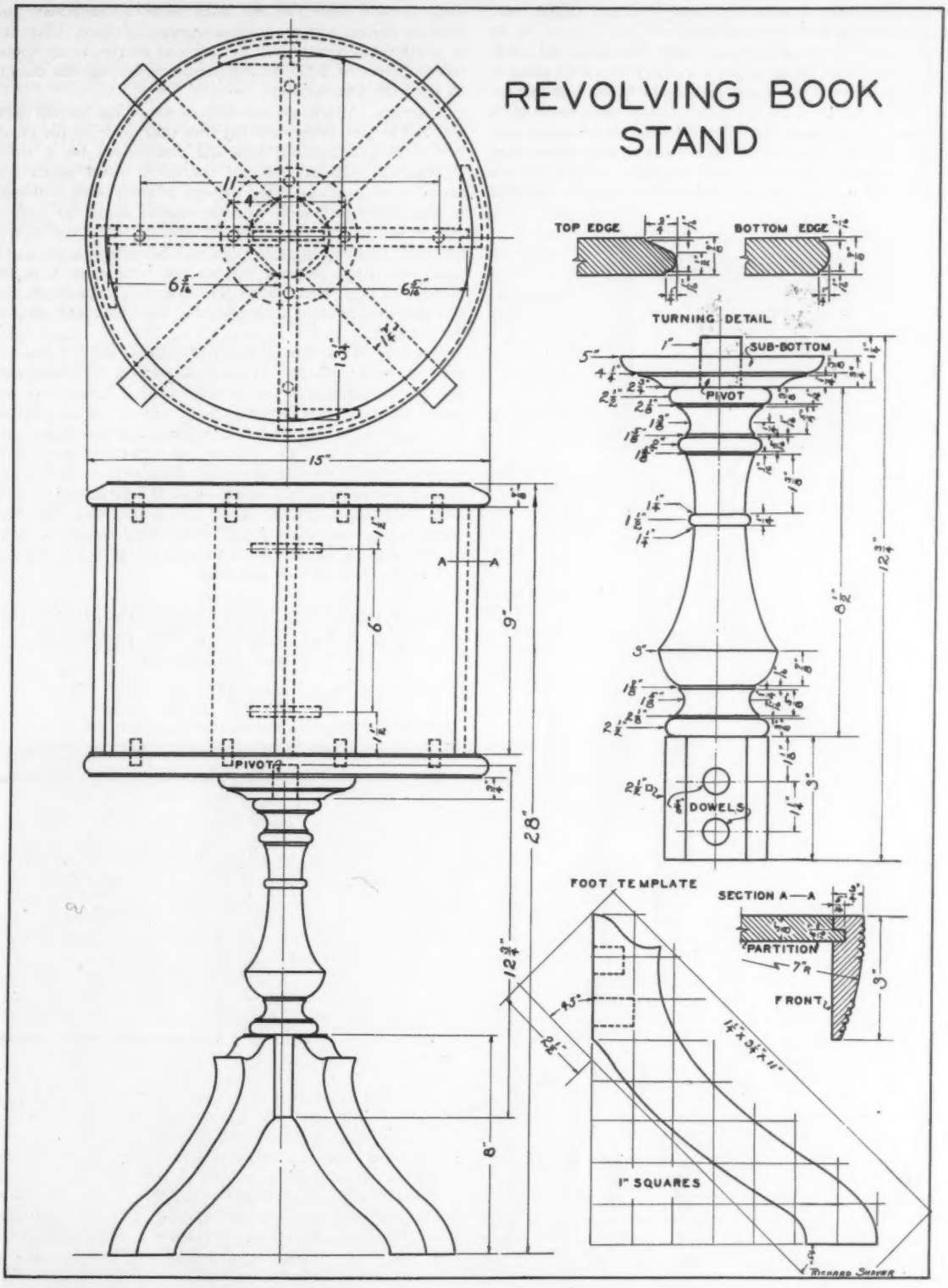
Richard Shaver, High School, Saranac Lake, New York

The revolving bookstand is one of the recently developed types of chair-side table which are so popular at present. It gets its name from the fact that the entire top unit, which contains the four book compartments, may be revolved on the spindle, so that any of the books may be easily reached. The top is large enough to be useful and will hold a reading lamp, sewing kit, or smoking set. The feet spread widely to overcome any top-heaviness which might develop, and the whole is light in weight so that it may be easily moved. While the project is not too difficult for a high-school woodshop student, it makes a sufficiently complicated job so that he may well feel proud of having built it, and his parents will find it useful. Its construction requires enough hand toolwork and machine operations to justify it with the instructor. It should be made of mahogany, walnut, or some wood which finishes well.

Directions

Spindle. Select and square up a piece of stock, 2½ by 2½ by 12¾ in. Lay out the part which is to be left square for the joint with the feet, and locate the holes for the dowels, but do not bore them until after the turning is finished. Glue a block of matching wood, ½ in. thick, 2½ in. wide, and 1½ in. long on each side of the piece, 4¾ in. from the end which is to be left square. This will build up the stick so that the 3-in. diameter required at that part can be cut. When the glue is hard, locate the centers for the lathe, and turn to size and shape, leaving the pivot dowel exactly 1 in. in diameter and cutting just enough off the corners of the square part, leaving the flats 1¼ in. wide so that the feet will fit tightly. Sand in the lathe and bore the ⅝-in. holes, 1 in. deep for the dowels.

Feet. On four pieces of stock, 1¼ by 3¼ by 11 in., lay out the 45-deg. lines, as indicated, and the shape of the feet from a template. Cut on the 45-deg. lines on the variety saw,



to insure a tight fit against the spindle and floor, and band-saw out the curved edges. Sand the band-sawed edges on a spindle, and the flat surfaces with block and sandpaper. Lay out dowel holes and check against the proper places on the spindle. Bore 5/8-in. holes 3/4 in. and 1 in. deep, as shown in template detail. Test by assembling with the spindle.

Sub-Bottom. The sub-bottom is attached to the bottom to give it more thickness so that a longer pivot dowel may be used and therefore make the pivot more rigid. Band-saw out a piece of stock, 3/4 in. thick, to 5 1/4-in. diameter. Attach to a faceplate and turn down, as shown in turning detail. Bore the hole which fits over the pivot dowel on the spindle and

test on the spindle. It should fit snugly but turn freely. Sand before removing from the faceplate.

Top and Bottom. These parts are best made of panel stock, either 13/16 in. or ⅞ in. thick. They should be selected for beauty of grain and should be absolutely flat and without wind. Band-saw to about 15¼-in. diameter and attach to a large faceplate, screwing into the underside. Turn the designs for the edges as shown in the details and be sure both pieces are the same size. Sand the turned edges in the lathe but not the veneered surfaces, as they will cut through very quickly.

REVOLVING BOOKSTAND

On the under surface of the top and the top surface of the bottom, locate the center lines for the partitions. Locate the dowels very carefully and bore ⅜-in. holes, ½ in. deep, if possible without the bit screw coming through the stock. On the underside of the bottom, in the exact center, bore a 1-in. hole ½ in. deep for the pivot dowel on the spindle. If stock less than ⅞ in. is used for the bottom do not bore that deeply, as at least ⅜ in. of the bottom should be left for the pivot screw.

Partitions. Select and square up two pieces, ⅝ in. thick, 9 in. wide, and 6 5/16 in. long, and one piece, ⅝ in. thick, 9 in. wide, and 13¼ in. long. Cut a rabbet 5/16 by 5/16 in. as shown in the top view, and section A–A, on each end of the long piece and one end of each short piece. Be sure that the rabbets are on opposite sides of the large piece. Locate and bore the holes for the dowels which assemble the three pieces and test to see that the top and bottom edges are flush when assembled. Glue and clamp these three pieces together until the glue has set. Locate and bore the holes for the dowels which attach the top and bottoms. Sand all over.

Fronts. Select and square up four pieces, ¾ in. thick, 3 in. wide, and 9 in. long, choosing pieces which will plane easily. Make a template of the shape of the ends, using a 7-in. radius, as shown in section A–A, and lay out on each end of each piece. Some of the waste stock may be removed on the variety saw with the table tilted, while the rest should be planed and sanded down to the lines. Cut a 5/16 by 5/16-in. dado in each piece for the joints with the partitions, and bead, as shown, with a universal beader if desired. They can be ornamented equally well by strips of overlay or by transfers if preferred. Glue on the partitions, leaving the clamps on until the glue has set.

Assembly. Attach the sub-bottom on to the bottom with glue and screws, being sure that they turn easily on the pivot. When the glue has set, bore and countersink for a screw through the bottom and into the pivot dowel which will permit it to turn easily but prevent it from being removed. A large screw set solidly into the spindle should be used so that it will neither loosen nor tighten when the top unit is revolved. This part must be assembled before gluing the partitions and fronts between the top and bottom, as it is impossible to do it later. When the entire job is glued up, and the glue dry, sand all over with 2/0 sandpaper and prepare for finishing.

Finishing. If a stained finish is desired, apply a coat of good oil stain and allow to penetrate, wiping off any deposit left on the surface. A coat of filler is next brushed on and wiped off as it flats, being sure to remove all except that left in the pores of the wood. A coat of white shellac will seal in these coats, and two or three coats of good clear varnish should complete the finish. Each coat of shellac and varnish should be rubbed smooth with 6/0 sandpaper or steel wool before the next is applied. Rub the final coat with pumice stone and oil to a dull finish. Care should be taken at all stages to prevent finish running in the pivot joint, or it may interfere with its operation.

ELEMENTS OF JOB COMPOSITION—IV

Frank P. Rich, Roxbury Memorial High School, Boston, Massachusetts

Harmony of Tone

Objects which are in accord, that is, objects that have something in common between them, are said to be harmonious.

GREETINGS
Christmas
JOHN SMITH

LIGHT TONE

Greetings
CHRISTMAS
1926
JOHN SMITH

DARK TONE

There is a harmony of tone in a typographical design when all the type faces used, the cuts or ornaments, and the borders are of the same degree of light and shade. If the type used is very bold and the lines are spaced closely, we have a dark tone. On the other hand, if the white of the pages considerably overbalances the black, we will have pages varying in tone from what might be termed very light to a gray tone, dependent upon the extent to which the white overbalances the black. The important thing, however, is to keep the design uniform in tone.

Certain classes of work demand a light tone and others a dark effect, both are equally satisfactory from an artistic standpoint when consistently carried out. As a general rule, however, people prefer those pages which are light in tone for the reason that they carry with them a sense of neatness and daintiness, qualities that are not so apparent when the bold types are used.

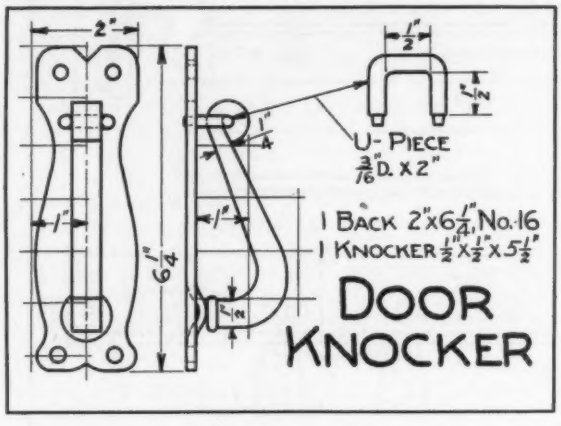
ANOTHER DOOR KNOCKER

J. W. Bollinger, Tulsa, Oklahoma

Door knockers are an heirloom handed down from past generations, and are still used for utilitarian and ornamental purposes.

1. Cut the back out of No. 16 gauge iron. This is approximately 1/16 in. thick. Draw 1-in. squares on the iron with a scratch awl, and draw in the design as shown in the drawing. Grind and file the back to shape.

2. Make a drawing of the shape of the knocker on a small piece of tin or galvanized iron.



3. To make the knocker, begin with a piece of ½ by ½ by 24-in. iron. Draw a taper on two sides about 3 in. long, bringing the tapered end down to ⅛ in.

4. Curve this end over the rounded edge of the anvil until it will fit loosely around a 3/16-in. rivet.

5. Curve the thick end according to the drawing, and cut off all except about ¼ in. of the excess stock.

6. Heat this end, place the knocker in the vise with the excess stock projecting, and upset the end. File smooth.

7. Begin the U piece by turning (or filing) about ⅛ in. off both ends down to ⅛ in. in diameter.

8. Clamp the knocker in the vise so that the hole will project. Heat the iron for making the U piece, put it through the hole so that an equal amount of stock projects on each side, and bend both ends down simultaneously with the help of two pairs of pliers.

9. Locate and drill two ⅛-in. holes for the U piece in the back, and rivet the parts in place.

10. To raise the part of the back where the knocker strikes, place the heated iron over the end of a piece of 1-in. pipe and strike the iron with the ball end of a machinist's hammer.

11. Drill the holes in the back for fastening the knocker to the door.

12. Give the completed job two coats of flat black paint.

A MINIATURE GOLF-COURSE PROJECT

T. D. Laurenson, Mount Carmel, Pennsylvania

The miniature golf course described herewith is an ideal project for the general shop as there is no limit to the hazards that the boys can plan and construct, or the size of the course which can be built small for use in the home or club, or social hall.

Figures 1, 2, 3, and 4 show the playing green and a few hazards. Also how the green can be folded up by hinging in the middle for storage or convenience in transportation.

Regular balls and putters may be used.

Some of the following suggestions may help the boys in their construction plans.

1. The hazards can be planned to be kept and transported in a box made of heavy paper board, or any other light mate-

A MINIATURE GOLF COURSE

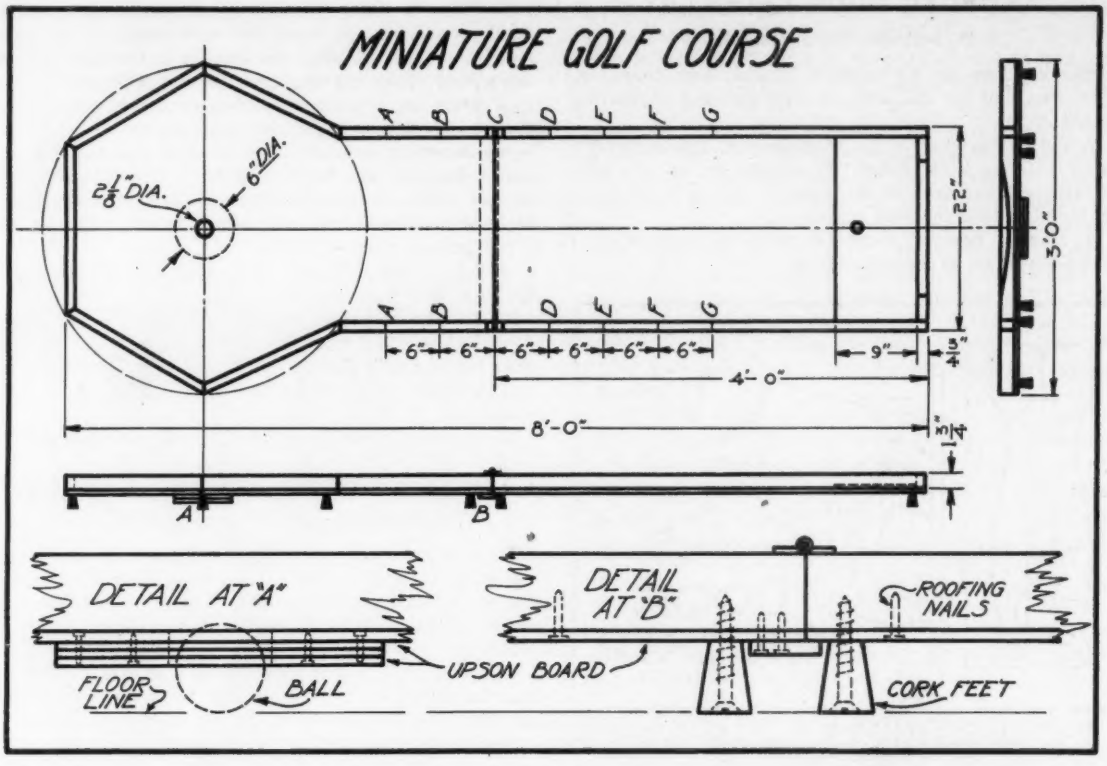


FIG. 5

rial. No definite dimensions or drawings are given for these hazards. Their design is left to the student.

2. Two courses can be cut from one piece of Upson board 10 by 4 ft. for economy (see Fig. 5).

3. Waste pieces can be used to reënforce the hole.

4. Some plyboard makes a good teeing mat.

5. Bottle corks 1¼ in. long fastened on with 2-in. flat-head screws make good feet.

6. Wood wedges can be used for leveling the course on the floor.

7. Some hazards that move easily when hit by the ball can be made more rigid by supplying them with felt pads which act as wedges when the hazard is placed between the sides of the course.

8. Bright colors used in painting add much to the attractiveness of a course and hazards.

9. Letter the side railings of the course as locations for the hazards with A, B, C, etc., about 6 in. apart, the same on both sides.

10. Letter the hazards with J, K, L, or the remaining letters of the alphabet.

11. A chart can then be prepared for playing as follows:

Hole	*Name*	*Location of Hazard*	*Par*
1	Bridge	T at G.	2
2	Small Triangles	J—D and K—F	2
3	Hill	U—D	2
4	Rough Ground	S—F	2
5	Rat Hole	R—C	2
6	Large Triangles	M—C and N—F	2
7	Loop-the-Loop	L—D	2
8	Water Hazard	W—F	2
9	The Knoll	O—E	2
	Then hazards can be combined		
10	The Narrows	J and K at F	3
11	Loop and Rough	L—B and S—H	3
12	Rail Fence, etc.	J—A, K—G, M—C, N—E	3

ELECTRICAL TEST

H. J. Johnson, Duluth, Minnesota

The following is Section III of this test. The entire test is composed of 200 questions.

Section III

Name..... Class.....

101. Buildings that are to be insured should be wired according to the National ———— ————.

102. Wiring within cities must be approved by the ———— ————.

103. Wires smaller than No. ———— B. & S. are not permitted for wiring.

104. ———— sockets should be used in all damp places.

105. The fuses in any given circuit should be of the proper size to protect the ————.

106. Fuses are made in two common standard types, ———— and ————.

107. When wiring must be done on the surface of a finished building, ———— or ———— is generally used.

108. The smallest size of conduit permitted is ———— in. in diameter.

109. A piece of iron or steel which will attract other pieces of iron or steel is called a ————.

110. Magnets have two poles, called ———— and ————.

111. Like magnetic poles ————.

112. Unlike magnetic poles ———— each other.

113. The earth acts like a large ————.

114. The number of degrees difference between the magnetic and geographic poles is called the ———— at that point.

115. The number of degrees that a dip needle dips from the horizontal is called the ———— at that point.

116. The early form of compass was a piece of natural

magnetic ore suspended by its center, and was called a ————————.

117. Permanent magnets are made in three common shapes, ————————, ————————, and ————————.

118. When a piece of iron is fully magnetized, it is said to be ————————.

119. Every electric conductor, when carrying current, is surrounded by ———————— ———————— ———————— ————————.

120. The magnetism which remains in an electromagnet after the current is shut off is called ———————— ————————.

121. When current flows into a straight wire away from the observer, the lines of force move around the wire in a ———————— direction.

122. When current is flowing out of a wire toward the observer, the lines move in a ———————— ———————— direction.

123. When wire is wound to form a coil, the lines of force unite and form ———————— at the ends of the coil.

124. Such a coil is called a ———————— or ————————.

125. An iron core with a coil of insulated wire wound around it is called an ————————.

126. Reversing the direction of current in an electromagnet reverses its ————————.

127. An electromagnet on alternating current reverses its ———————— many times per second.

128. The strength of an electromagnet depends upon the number of ———————— ————————.

129. A coil used on alternating current will generate a current in a second coil placed around it. This process is called ————————.

130. An iron core, with a primary and secondary winding, is called a ————————.

131. A transformer is used to step up or down the ———— ————of an alternating current circuit.

132. When direct current is put into the primary, it must be interrupted in some way, and the device is called an ———————— coil.

133. A simple alternating-current generator has two ———— ———— and a simple direct-current generator has a————.

134. The direction of rotation of a motor may be reversed by reversing the direction of current in the ———————— or ————————, but not in both.

135. Direct-current motors are of three common types, ————————, ————————, and ————————.

136. Small alternating-current motors are of the ———— type.

137. A motor that will run equally well on alternating and direct current is called a ———————— motor.

138. Every direct-current motor consists of four main parts, ————————, ————————, ———————— and ————————.

139. An alternating current is one which ———————— throughout the circuit many times per second.

140. In large alternating-current generators, called alternators, the ———————— revolves and the ———————— is stationary.

141. The revolving part is called the ———————— and the stationary part is called the ————————.

142. One complete wave of alternating current is called a ————————.

143. Half a wave is called an ————————.

144. The number of cycles which the current makes per second is called the ———————— of the current.

145. The frequency of current used for lighting circuits in our city is ———————— cycles per second.

146. A condenser causes the current in an alternating-current circuit to ———————— the voltage.

147. An inductance or choke coil in an alternating-current circuit causes the voltage to ———————— the current.

148. The capacity of condensers is measured in ———— and ————————.

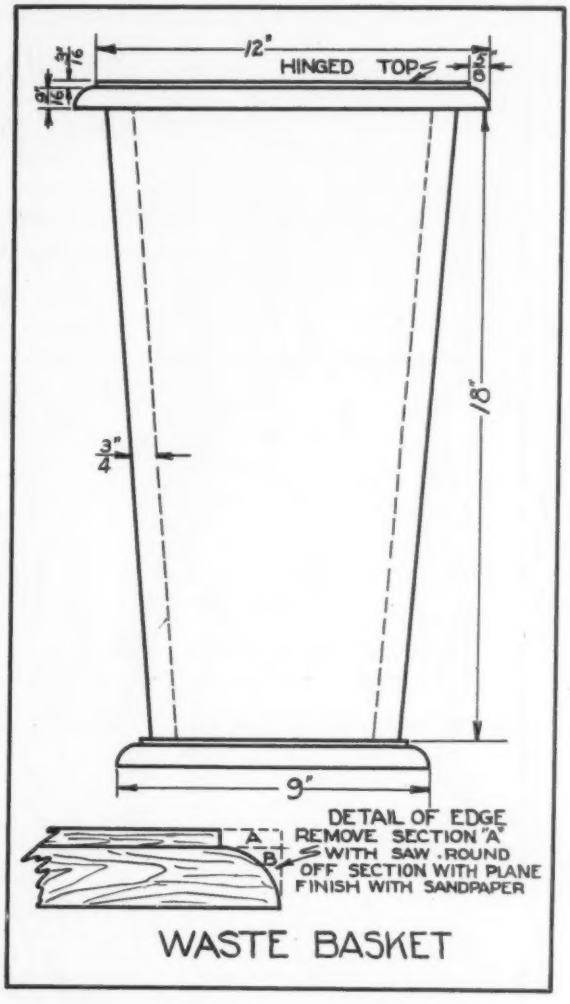
149. The inductance of coils is measured in ———————— and ————————.

150. When the current and voltage are exactly together, they are in ————————.

WASTEBASKET

C. M. Jochem, Jr., Pompton Lakes, New Jersey

The wastebasket described herewith is quite modern in design. It may be constructed according to the drawing and used in almost any room. It should be finished to harmonize with the color scheme of the room in which it is to be used.



WROUGHT-IRON TABLE LAMP

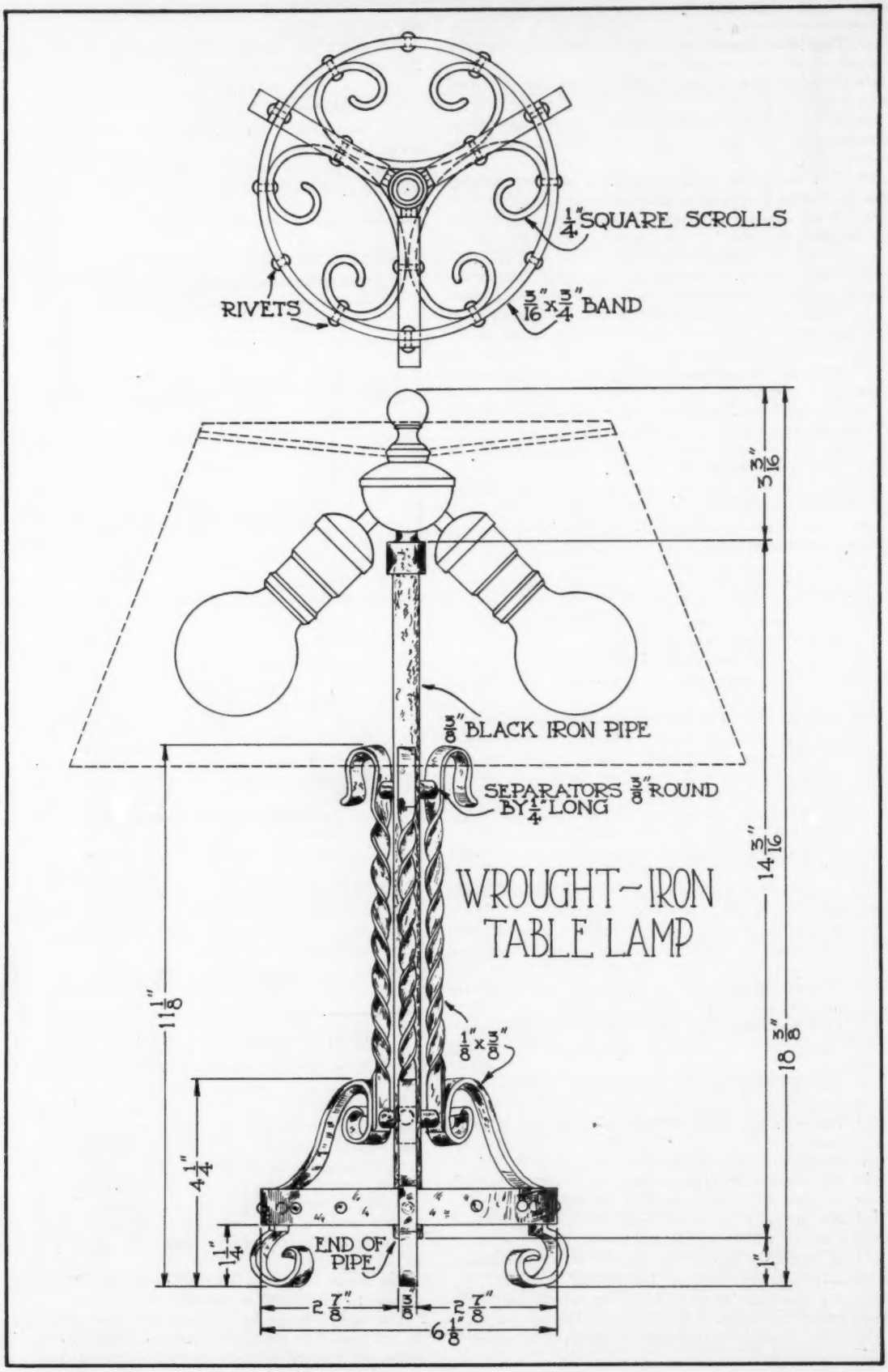
John I. Mattson, Grover Cleveland High School, Seattle, Washington

The wrought-iron table lamp described herewith was designed by the author and drawn by one of the author's eighth-grade pupils. It was constructed by the pupils of the metal shop under the supervision of Mr. James Bolman, and it was found to be an easy and interesting project.

While the design may seem rather plain from the front view it really is quite interesting because of the scrolls in the base which can nearly always be seen when looking at the lamp.

The center support is made of ⅜-in. black iron pipe, and should be hammered or tooled.

The twisted straps by the side of the pipe are ⅛ by ⅜ in., and should be tooled or hammered before twisting. These straps are fastened to the center pipe by screws whose heads


1/4" SQUARE SCROLLS
RIVETS
3/16" x 3/4" BAND
3 3/16"
3/8" BLACK IRON PIPE
SEPARATORS 3/8" ROUND BY 1/4" LONG
14 3/16"
WROUGHT-IRON TABLE LAMP
11 1/8"
1/8" x 3/8"
18 3/8"
4 1/4"
1 1/4"
END OF PIPE
1"
2 7/8"
3/8"
2 7/8"
6 1/8"

should be filed or hammered after the lamp is assembled so the screw slots will not show. The twisted straps are separated from the pipe by a button or separator made by cutting ¼-in. pieces off a ⅜-in. round bar, and drilling a hole through the center for the screw to pass through.

The scrolls making the feet also are made from ⅛ by ⅜-in. straps, and should be tooled before bending. They may be welded to or just lapped against the twisted straps forming the shaft.

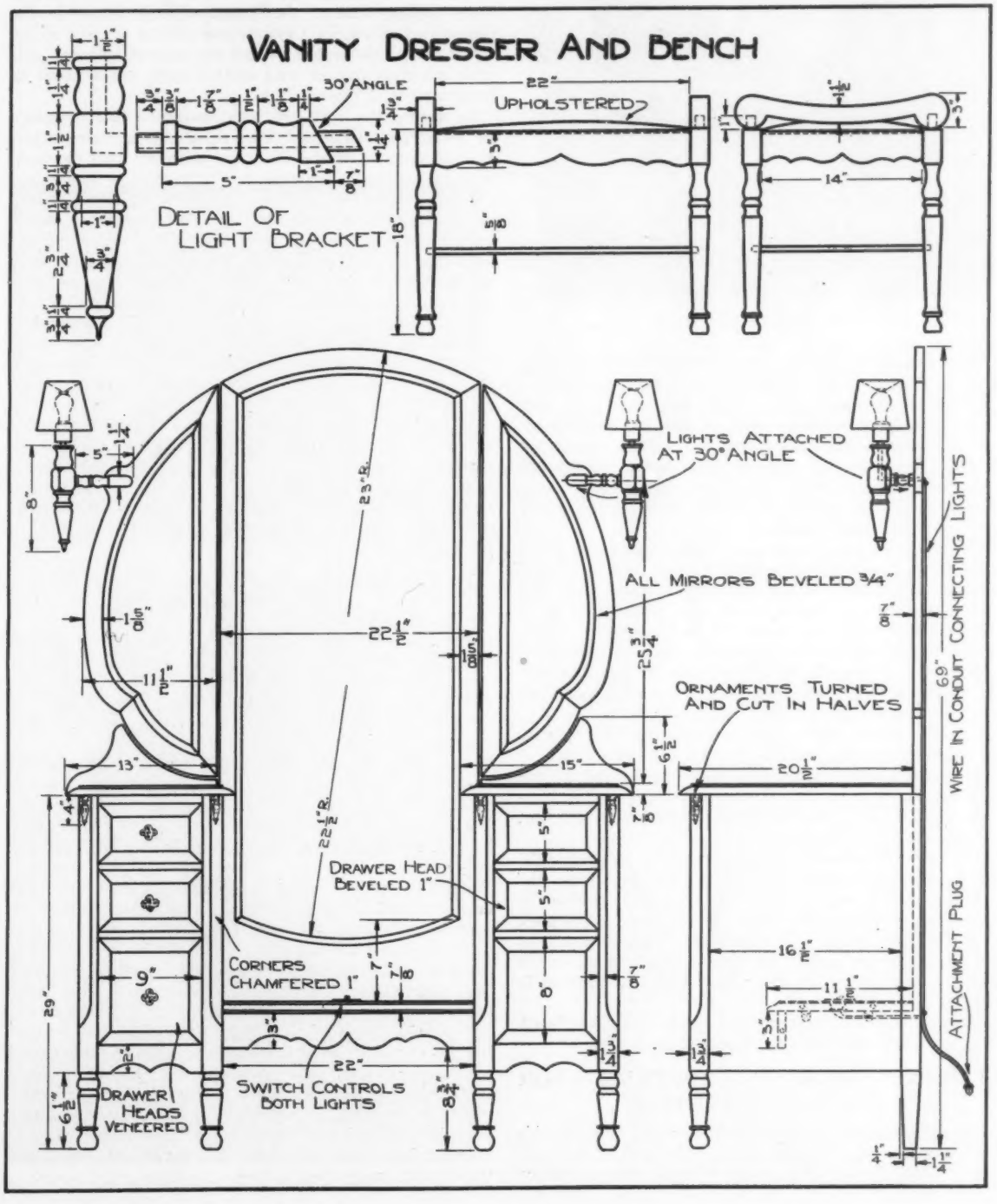
The scrolls inside the circular piece forming the base are fastened or tied to each other by a 1/16 by ¼-in. tie strap or ring and then riveted to the circular base. All scrolls and straps with scroll ends should be flattened out to a sharp point. The lamp fitting can be screwed into the pipe cap that has been tapped for it.

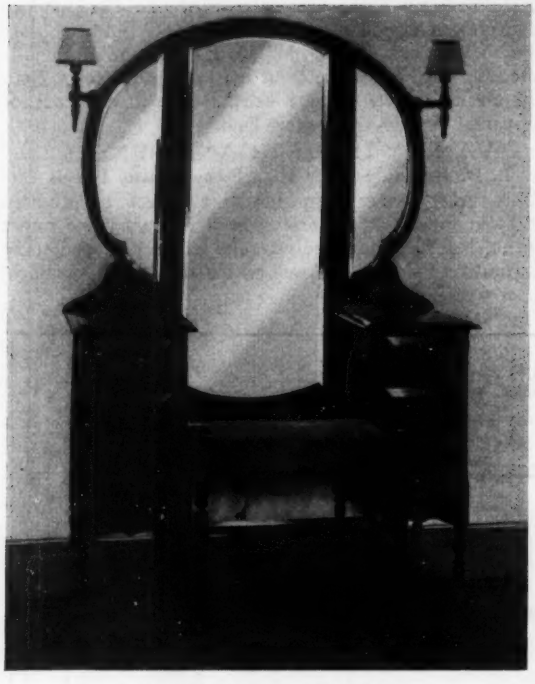
Finish with one coat of dull black paint and when it is thoroughly dry, rub off most of the paint with emery cloth until all high spots become bright. Give it one coat of transparent lacquer or bronzing fluid.

VANITY DRESSER AND BENCH

L. D. Jenkins, Sumner High School, Cairo, Illinois

This vanity dresser is an interesting project for advanced classes in woodwork. At first sight it appears to be rather difficult, but when analyzed carefully it will be found to be comparatively simple, and well within the capacity of high-school students.





VANITY DRESSER AND BENCH

The construction of this dresser involves four principle types of joints; namely, dowel, spline, dovetail, mortise and tenon. After the lower parts of the eight legs have been turned, the drawer sections should be made and considerable care be taken in squaring the front parts which receive the drawers. The front rails separating the drawers are tenoned into the legs and squared before gluing. This is very important, as it will give considerable trouble in fitting the drawer heads, if not properly squared.

The rear of each drawer section may be paneled with ¼-in. 3-ply stock. The tops are then fitted and if a shaper is not accessible a kerf may be cut 1 in. from front and sides with the circular rip and cross-cut saws to a depth of ⅛ in. A rabbet plane is then used to cut the desired bevel.

The sides of each drawer section are made of ⅞-in. stock and doweled or tongued and grooved into the legs. The middle section is then made and doweled into each side. This may be strengthened by using corner braces.

The large mirror frame is constructed in such a way as to fit snugly between the rear legs, bracing the side sections.

The top and bottom rails are formed by describing a circle with a radius of 23 in. The side mirror frames are a continuation of the 23-in. radius on either side of the large frame, and the lower ends are formed by irregular curves.

The light brackets are turned and placed at an angle of 30 deg. to the frames with a round mortise-and-tenon joint. The lights on the side mirrors are a very practical feature of the dresser as they permit the shifting of the dresser to any place in the bedroom within the radius covered by the length of the extension cord. Both lights are controlled by the switch shown in the illustration, the wiring offering a problem in simple electrical circuits.

Mortise-and-tenon joints are used on the bench. The bench may be upholstered with blue velour to good effect.

LIABILITY OF SCHOOL DISTRICTS FOR INJURIES TO PUPILS

Generally speaking, a school district cannot be held liable for injury to pupils of public schools suffered while in attendance, in the absence of a statute creating such a liability. This rule is based on the proposition that the operation of the schools is a purely governmental duty, imposed for the benefit of the public, and not for profit.

In some states, there are statutes that expressly impose liability upon school districts for injuries to pupils caused by the negligence of teachers or other school agents. Actions for injuries in such cases are, of course, governed by the provisions of the statutes under which relief is sought. Under a statute of this kind, a school district may be called upon to assume an unexpected and substantial liability if a case be made against it. As an illustration of the seriousness of such a situation for a school district, the California case of Maede v. Oakland High School, 291 Pacific 874, is in point.

The plaintiff, a boy of 15 years, was a student in a vocational-training class of the Technical High School in the Oakland school district. Oxyacetylene welding was part of the curriculum of the class to which the plaintiff belonged, and upon a certain day he with another pupil was assigned to braze a piece of brass.

In starting the work, the boys discovered that the gauge on the oxygen tank leaked. They reported it to their teacher. He told them to remove the gauge assembly from the tank, while he went to an adjoining shop to get another. Going into the shop, the teacher by mistake got the wrong type of gauge, and returning with it ordered the boys to connect it to the oxygen tank. The connection was made, and when the plaintiff turned on the pressure in the oxygen tank, the gauge blew out and some of the glass struck the plaintiff, with the result that he lost one eye and suffered other serious injuries.

An investigation revealed that the plaintiff's teacher had obtained the wrong gauge from the workshop. The gauge he had obtained would not withstand the pressure in the oxygen tank, so that the resulting accident was caused by supplying the wrong type of gauge.

The plaintiff brought suit to recover damages for the loss of his eye, under a California statute that provided statutory liability of the school district. The case was tried before a jury and resulted in a judgment for the plaintiff of $35,000 against the school district. The latter appealed from the judgment, but the court upon reviewing the evidence, affirmed the judgment appealed from.

DETERMINING MOISTURE CONTENT OF WOOD

The Forest Products Laboratory, Forest Service, United States Department of Agriculture, has developed an instrument called a "blinker" which permits the rapid determination of moisture content in wood. This takes the place of the old oven-dried process which was time-consuming and wasteful.

The new instrument, as described by C. G. Suits and M. E. Dunlap, engineers in the service of the Forest Products Laboratory, depends upon a simple circuit that operates on 180 volts d.c. As shown in Figure 1, the circuit consists of a battery, a resistance unit, a condenser, a neon tube, and a switch. When the circuit is closed the condenser is charged through the resistor, which regulates the current flow, permitting a gradual building up of the voltage across the condenser and the tube in parallel with it. Ionization in the tube occurs at a definite potential. The ionization point is indicated by a flash through the tube, which reduces somewhat the voltage across it. When the condenser charge again builds up, another flash takes place, as represented diagrammatically in Figure 2. If the resistance is increased the period between the flashes will be increased, and if it is lowered the period will become shorter. Thus the approximate value of the moisture content of a piece of wood may be obtained by using a sample of the wood as the resistor and counting the number of flashes in a unit of time. Such a determination is possible because of the relationship between the moisture content and the electrical resistance of wood.

Figure 1 outlines the fundamental circuit. An arrangement for moisture-content determination is given in Figure 3, which shows a two-branch circuit energized by a single battery. For one branch a standard resistor R_s, a condenser C_s, and a neon tube N_s are selected so that the neon tube will indicate at a rate of approximately 1 flash a second. For this purpose the resistor may be approximately 4 megohms, and the condenser about ¼ microfarad. These values will vary somewhat with the properties of the neon tube used. If a larger flash is desired a larger condenser may be chosen and a somewhat lower resistance substituted.

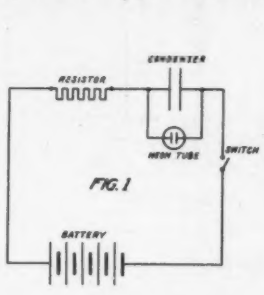


FIG. 1

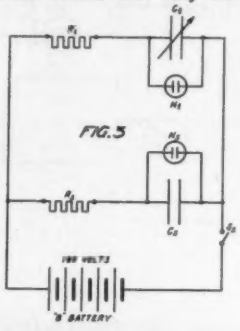


FIG. 3

The instrument is so arranged that when a sample of wood is introduced into the other branch of the circuit, any one of a number of condensers varying in capacity from 0.000044 microfarad to about 5 or 6 microfarads may be switched into the circuit. The frequency of flashes of the test lamp N_t can thus be adjusted to approximate that of the standard lamp N_s. The values of these condensers, instead of being expressed in microfarads, may be expressed in moisture content, so as to give direct readings.

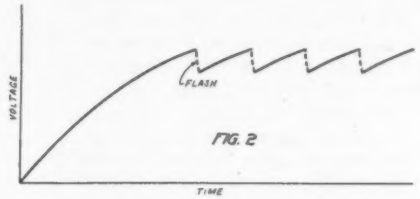
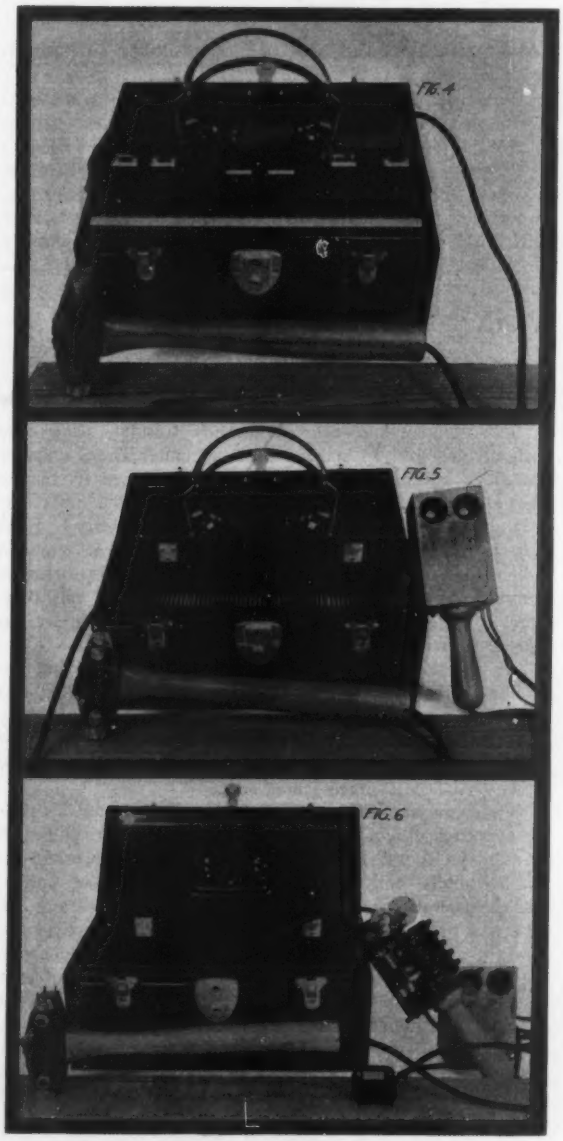


FIG. 2

Using the branched circuit as a basis, two instruments have been designed, one of which is intended for the measurement of moisture content between the limits of 8 per cent and 26 per cent, at intervals of 1 per cent, while the other is intended for sorting lumber for moisture content. These instruments are illustrated in Figures 4 and 5, respectively. Figure 6 shows the sorter with the hood removed to uncover the two tubes and the condensers.

Figure 7 presents the wiring diagram of the moisture measurer. The switches S_7 to S_{26} are shown open only because the diagram is easier to read that way. In actual use all these switches are normally closed, all condensers in consequence are initially in circuit, and the determination is made by opening switches in turn, thus cutting out all condensers to the right of the open switch, until the test neon lamp N_t flashes at the same rate as the standard lamp N_s. When this condition of equilibrium has been established, the number of the open switch gives the moisture content desired. The "wood sample" that is represented in a simple manner in the diagram is, of course, the wood into which the hammer points are driven.



THE MOISTURE-DETERMINING APPARATUS

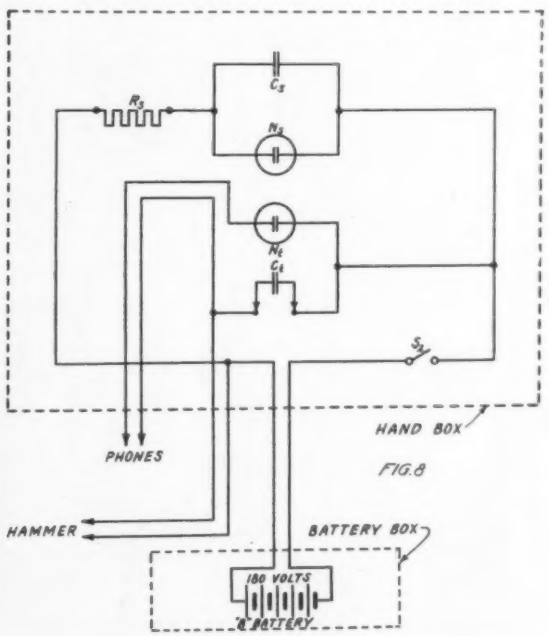


FIG. 8

FIG. 8

The lumber sorter is designed merely for determining whether the board tested is wetter or drier than some designated moisture content. Its proper use is in selecting lumber to meet moisture-content specifications set up by lumber associations or purchasing agents. Figure 8 gives the wiring diagram of the sorter. The only essential difference between the circuits of the measurer and of the sorter is in the condensers. Instead of the many condensers of the measurer, all of which are constantly available, the sorter has only one test condenser C_t, in circuit at any one time. This condenser is selected from a set to make the sorter indicate equilibrium at any value of moisture content that may be desired, and is plugged into circuit to remain until the sorting job in hand has been completed. If the test lamp flashes faster than the standard lamp, the moisture content of the sample is higher than the limit for which the sorter is adjusted; if it flashes at the same speed, the moisture content is equal to the limit; if it flashes more slowly, the moisture content is below the limit.

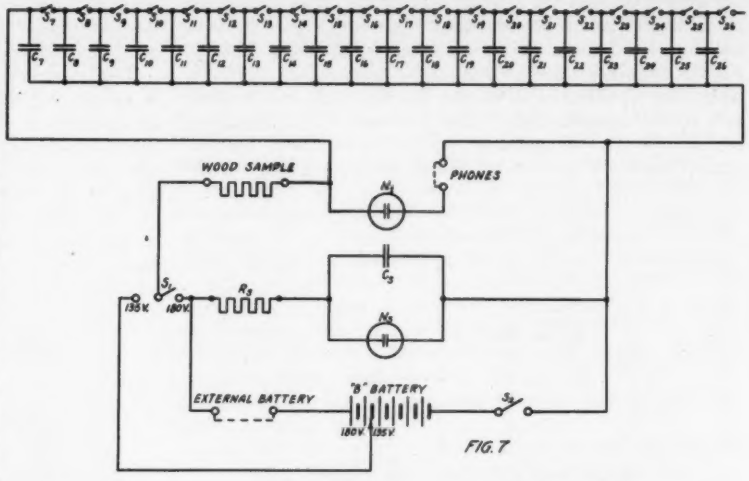
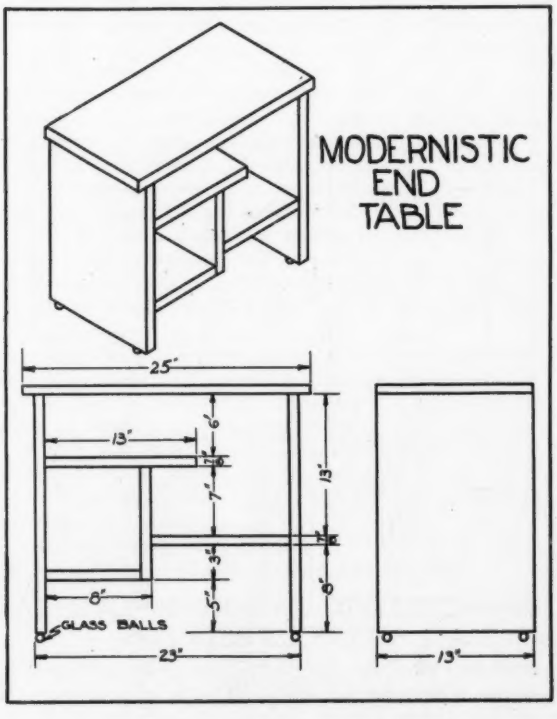


FIG. 7

Convenience and speed of operation were primary considerations in the design of the lumber sorter. The sorting may be done with the use of head phones or by visual observation of the flashing of the two lamps, as the inspector prefers. The lamp bulbs are below the two circular openings shown in Figures 4 and 5.

An effort was made to design the contact electrodes in a convenient fashion so that the operator will find it easy to drive the points into even the harder woods. To this end, four points are set in the ends of the hammerlike implement shown in Figure 4 so that the points will be put into operating position by driving them into the wood to be tested. The correct force to apply when driving the points into place is quite quickly determined by trial.



MODERNISTIC END TABLE

Carl v. Lindeman, Paw Paw, Michigan

A very attractive end table of modern design is shown in the illustration.

The project is made of 7/8-in. wood, but 3/8-in. material may be used, as the design is such that the shelves assist in bracing the lower part. Finishing nails and glue are used to put the project together. Small glass knobs are used for shoes or slides. These may be of the type used for drawer pulls. Care must be taken to assemble the shelf section first, after which the sides and top may be put together. The complete project is given a thin coat of shellac allowing it to dry several hours before applying the lacquer. Transfers may be used on the sides or top, if desired.

A SHEET-METAL-STUDY SCHEDULE

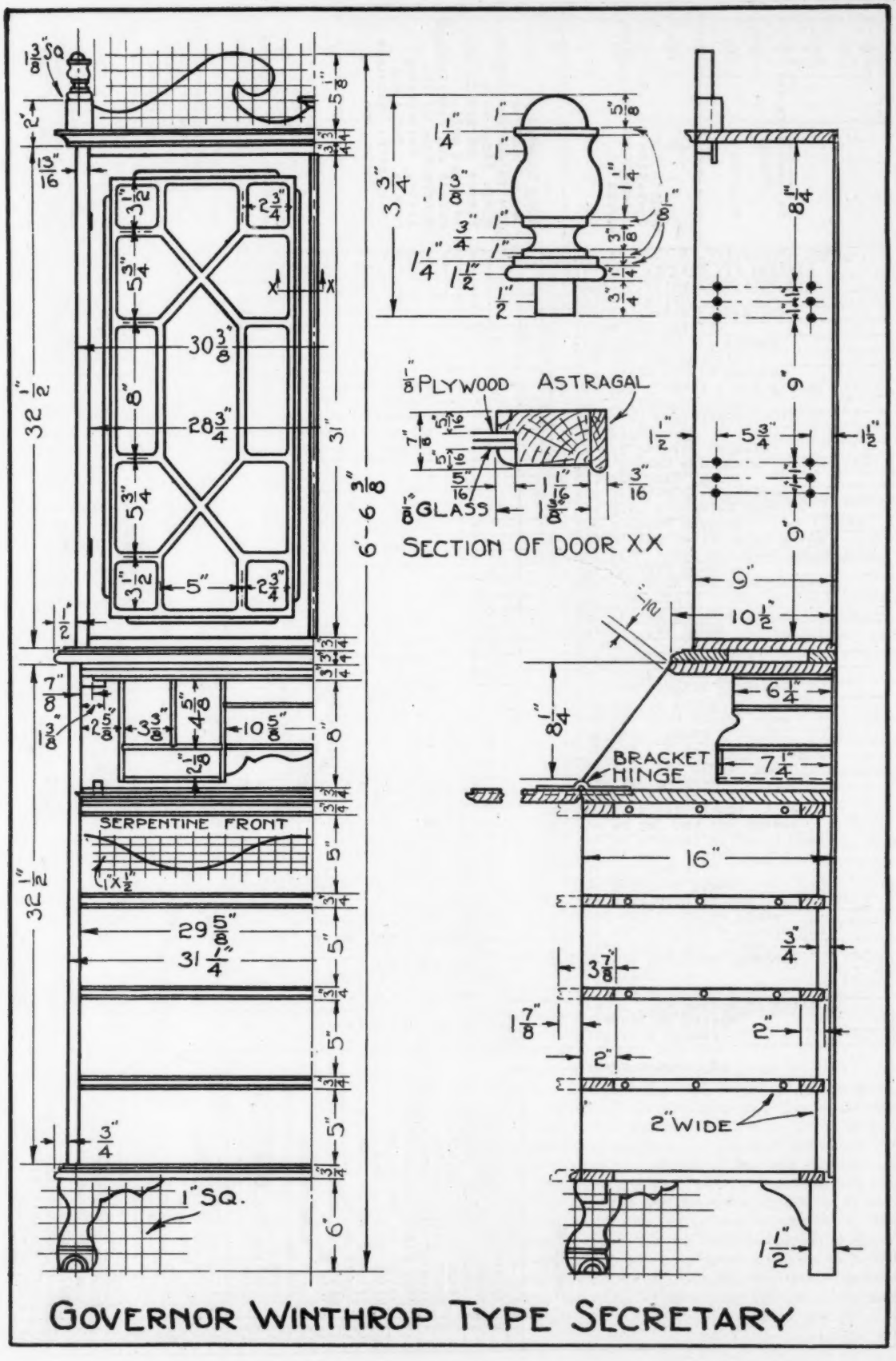
Frank D. Rohmer, Lincoln High School, Midland, Pennsylvania

The accompanying sheet-metal-study schedule shows the work divided into 53 specific teaching units. These units or operations cover quite thoroughly the fundamentals of the sheet-metal worker's art. In order to present the units correctly, a series of 34 projects has been arranged. Each project or lesson gives the student an average of one and one-half new operations to master along with a repetition of many operations previously learned. Each project has commercial value except Nos. 1 and 2. All of them are inexpensive to produce.

The operations or teaching units have been laid out according to the learning difficulty. It is not claimed that this schedule is complete, nor that the 53 operations outlined fully cover the content of the sheet-metal worker's trade. These operations are, however, of such a nature that they may be presented in the average school shop.

New operations are indicated in the chart by an X, while the operations previously mastered on any job are indicated by numbers. A series of 34 job sheets have been worked out which combine both operation and job sheet in one unit so that the operation is taught at the time it is needed and also on a real production job. This does away with exercises and presents a specific need to the student for learning each new operation as it arises. It also shows the application of each new operation as the boy learns how to perform it. The schedule, together with the individual instruction sheets or units, permits each student to progress according to his individual ability. Likewise new students may enter the class at any time regardless of how long the class has been organized.

| PROJECTS | TRADE OPERATIONS | 1 Tinning a Copper | 2 Elements of Filing | 3 Use of Shop Scales or Rules | 4 Cutting with Snips | 5 Soldering | 6 Lay Out Patterns (Simple) | 7 "Draw File" Tin Plate | 8 Use Folder(Sing.& Double Hem) | 9 Bend and Fold Tin Plate | 10 Use Slip Roll Former | 11 Use Squaring Shear | 12 Lay Out Radius | 13 How to Read a Blue Print | 14 Use of Special Molds or Dies | 15 How to Lay Out Odd Shapes | 16 Use of Steel Square | 17 Lay Out Box Pattern | 18 Make Lap Corners | 19 Use Jigs and Clamps (Note) | 20 Cutting Die Curves and Edges | 21 Use Solid Punch | 22 Lay Out from Center Line | 23 Use Hollow Punch | 24 Folding Complex Patterns | 25 Use Folder-Turn Wire Edge | 26 Use Wiring Machine | 27 Riveting | 28 "Brake" Tin Plate | 29 Make Solid Corners | 30 Use Groovers | 31 Use Crimping and Beading Mach. | 32 Use Turning Machine | 33 Rad.Dev. - Lay Out Cone Sh.Pattern | 34 Trans. Pat. with Prick Punch | 35 Use Burring Machine | 36 Use Double Seaming Machine | 37 Use Setting Down Machine | 38 Setting Down "Hand" | 39 Make Hinges and Hasps | 40 Double Seaming Corners | 41 Use Hand Dolly | 42 Parallel Development | 43 Use of French Curve | 44 Lay Out 2 and 3 Piece Elbows | 45 Use Elbow Edging Machine | 46 Lay Out Tee Pattern | 47 Cone Pattern - 2 Pieces | 48 Using the Drill | 49 Corner-Double Folded Seam | 50 Triangulation | 51 Triangulation from Side View | 52 Lay Out Flaring Lip Pattern | 53 How to Make a "Pittsburgh Seam" | Related Work and Studies
Remarks | Note:
Operation No. 19
Substitutes for cornice brake |
|---|---|---


SERPENTINE FRONT
1" SQ.
SECTION OF DOOR XX
PLYWOOD
ASTRAGAL
GLASS
BRACKET HINGE
2" WIDE
GOVERNOR WINTHROP TYPE SECRETARY

GOVERNOR WINTHROP SECRETARY

Allan V. Winegard,
Glenside-Weldon Junior High School, Roslyn, Pennsylvania

This old favorite secretary is made of mahogany. It offers excellent opportunity for some unusual schoolwork, such as making the serpentine drawer fronts and cutting out the feet.

GOVERNOR WINTHROP SECRETARY

The desk part is made first. The framework that the drawers slide on are glued and screwed to the sides. The back is of ¼-in. plywood and is rabbeted in place. A ¾ by 2-in. strip, dadoed to fit the drawer rests, runs up the center of the back to strengthen it and prevent the rests from sagging. The bottom drawer rest extends ¾ in. beyond the sides and has a molding edge. The feet can be cut from 3 by 3-in. stock, and the bracket fastened on later. The feet are glued and screwed to the base.

The desk lid is hinged with special bracket hinges. These hinges are a combination hinge and bracket and are to be preferred to separate hinges and lid supports.

The book shelves in the bookcase are adjustable. Holes are drilled for movable shelf supports.

One-eighth-inch plywood is used for the enrichment of the doors, and bullet catches keep doors closed.

To make the drawer fronts, glue up stock to 6 in. thick and 5 in. wide, and cut out on the band saw.

The drawer pulls, door knobs, and hinges are finished in old silver.

The secretary is given a dull rubbed finish.

NOW, Are There Any Questions?

Painting Auto Wheels

946. Q.: I have a new Ford, and I want to paint the wheels (wire) yellow, to match the body stripe. Will you please tell me how to proceed? And what would be the best kind of paint? Would the black paint on the wheels make a good foundation? — *E. C. V.*

A.: In regard to painting the wire wheels of the Ford, I assume this work is to be cut in by hand. First it will be necessary to have the wheels clean by washing thoroughly with a good cleaning powder like painters' Savagran or Oakite, following the directions on the manufacturer's package. A complete rinse with the hose should then follow, after which the wheels should be dried in a warm room overnight. If possible they should be removed from the axles and mounted on a pipe bar at a height that will make it convenient for the work and will permit working on both sides alternately besides allowing the free turning of the wheel. The time involved in rigging such a jig will be more than saved in the time consumed in painting. As a matter of fact, an old broomstick thrust through the hub of the wheel, supported on two large packing boxes will do very well for this small job.

The proper material to use for painting these wire wheels is a quick-drying auto enamel of the one-day type and the best brushes will probably prove to be the ½-in. and 1-in. fitch or other soft-bristle type. First brush in the hub and rims complete with a 1-in. brush and then use the ½-in. to coat in the spokes with a stroke working from the ends thereof and leaving at the center. With a little care one coat may be sufficient. On the other hand, two coats with a light rubbing of steel wool on the well-dried first coat followed by a very careful and thorough dusting to remove all traces of wool will give a much more durable job. The black paint now on the wheels should prove entirely satisfactory as a base but should be lightly mossed off before applying the first coat in order to increase adhesion. — *Ralph G. Waring.*

Refinishing an Undertaker's Table

948. Q.: I would like information in regard to refinishing an undertaker's surgical table. This is a metal table, and white enamel has been used before but comes off very easily. As you probably know what the ingredients in embalming fluid are, I feel that you will be able to inform me as to the best steps to take. — *J. M. H.*

A.: All tables of this kind which I have seen have been metal covered with white vitreous (baked) enamel. When this becomes badly chipped and refinishing is necessary, the problem is a difficult one to say the least. Where efficient spray equipment is available, then a lacquer system is the most desirable. However, I take it that none is at hand, hence the following specifications are for hand-brushed materials:

1. Strip off all old finish with varnish remover and No. 2 steel wool and a steel scratch brush.
2. Wash all portions with clean denatured alcohol and clean steel wool. Wipe dry with clean cloths.
3. Sand all rusted metal spots to bright metal with sandpaper or steel wool. Rewash with clean rags and alcohol to remove all traces of handling.
4. Use a soft-bristle brush (Fitch) to apply a coat of an oil-type metal primer, as made for auto bodies. Dry overnight in a warm room.
5. Use auto glazing putty, and a flexible putty knife to level up all chipped enamel areas. Dry hard, then water-sand level with a rubber or felt pad covered with "wet or dry" 6/0 sandpaper and water. Wipe clean and dry after sanding and sponging. Let dry 4 hours.
6. Give a second coat of metal primer. Let dry at least overnight in a warm room.
7. Apply a well-brushed-out coat of any standard 4-hour enamel, as Pratt & Lamberts or Murphy varnish companies. Let dry overnight, then sand with a split 6/0 finishing paper, wet preferred.
8. Apply as many coats of finishing enamel as necessary to give the desired coverage. Allow 24 hours between coats, sanding each in turn.
9. Let the last coat remain in the full gloss, and if possible let dry a week before putting in service.

Since the standard embalming fluid is principally some form of formaldehyde, the newer types of enamels will be found to be more resistant than the older, slower-drying oil types.

The tricks of the trade necessary to turn out a high-class job will be found in the chapters on varnishing, as well as those dealing with auto enameling, as contained in my *Principles of Mill and Paint Shop Practice* recently published by the Bruce Publishing Co., Milwaukee. — *Ralph G. Waring.*

New Publications

An Introduction to Vocational Education

By Arthur B. Mays. Cloth, 323 pages, 5½ by 8. Price, $2. Published by The Century Co., New York, N. Y.

The author of this book succeeds admirably in laying down the fundamental problems and the primary aims of industrial education in such a way that layman, student, and teacher can more clearly see the purposes and problems of this type of education. The relationship between industrial education and other types of education is clearly shown, and the different types of vocational education—agriculture, commercial, home-making, industrial, etc. — are dealt with in separate chapters.

Woodworking Note-Book

By P. R. Harshbarger. Paper, 65 pages, 7¾ by 10½, illustrated. Price, $1. Published by Des Plaines Publishing Company, Des Plaines, Ill.

This notebook is designed for the junior-high-school student of woodworking. It contains all the necessary preliminary directions, assignment sheets, information sheets, and operation sheets. Space has been reserved for any additional notes that the student may want to make for his own future use.

Selected Furniture Drawings

By William W. Klenke. Cloth, quarto, 66 pages. Price, $3. Published by The Manual Arts Press, Peoria, Ill.

Forty-six designs for furniture, based on American colonial precedents, are presented in this book in the form of carefully detailed working drawings, photographs, and brief descriptive articles. None of the problems is too difficult for the advanced student of high-school cabinetwork.

The introduction contains the usual directions for using woodworking machinery and finishing furniture.

Bookbinding

By F. R. Smith. Paper, 113 pages, 5 by 7½, illustrated.

Stencilling

By F. R. Smith. Paper, 109 pages, 5 by 7½, illustrated.

Lino Prints

By M. Dobson. Paper, 130 pages, 5 by 7½, illustrated.

Printing

By E. G. Porter. Paper, 88 pages, 5 by 7½, illustrated.

These four books are published by Isaac Pitman & Sons, Inc., New York, N. Y. Price of each, $1.

They are bound in stiff paper covers and are all part of the Pitman's "Craft For All" Series. The books are well illustrated and the directions are simple. In most cases the equipment that is needed is of the home-made variety.

The Modern Motor-Driven Woodworking Shop—II

By Herbert E. Tautz and Clyde J. Fruits. Cloth, 225 pages, 6 by 9, illustrated. Published by Woodworkers Educational Department, Delta Manufacturing Co., Milwaukee, Wis.

This is the second book on this subject by these authors. It takes up in detail the construction and operation of the wood-turning lathe, the band saw, scroll saw, and boring, routing, and mortising machines. There is also a chapter on motors for operating woodworking machinery. Volume II, like Volume I, is well and copiously illustrated so that the reader can readily see just what the authors intend to convey.

Furniture Boys Like to Build

By Richard Shaver. Cloth, 216 pages, 7½ by 10, illustrated. Price, $3. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book contains 55 well-built and well-designed projects. All of the projects are illustrated both with halftones and with detailed drawings, and a variety of designs of the various types are shown. The book also contains a chapter on finishes and how they are applied.

Among the Industrial-Arts Teachers

L. R. ABBOTT DIES

With the death of L. R. Abbott, director, department of manual training and industrial education, Grand Rapids, Mich., the industrial-arts movement loses one of its most earnest pioneers.

He was born at Winsted, Conn., July 11, 1872, attended school at Hartford, and finished at Worcester Polytechnic Institute from which he was graduated in 1894.

L. R. ABBOTT
From a photo taken in 1916

He taught at Trenton, N. J., and at Moline, Ill. He then came to Milwaukee where he taught industrial-arts work from September, 1904 to August, 1906. From there he went to Grand Rapids, where he organized industrial-arts work in the public-school system, bringing it to a high point of efficiency during the 25 years of his service in that city.

Mr. Abbott's death will be sincerely mourned by all who ever came in contact with his kind, sympathetic personality, and his list of friends includes men from all parts of the United States.

He was actively prominent in a number of national, state, and city educational organizations and was equally well known as a church worker. He died after an illness of about one month, and is survived by two sons and one daughter.

¶ Mr. E. C. Mason, of Hopkinton, Iowa, has been elected as manual-training instructor in the high school at Elkport.

¶ Mr. John J. Enge, formerly woodworking instructor at the Tilden Technical High School, Chicago, Ill., passed away recently after nine years of teaching at that school.

¶ Mr. C. F. Friese, machine-shop instructor at the South Division Continuation School, Chicago, Illinois, has retired after having taught in school shops since 1886. His successor is Mr. Mueschell.

(Continued on Page 14a)

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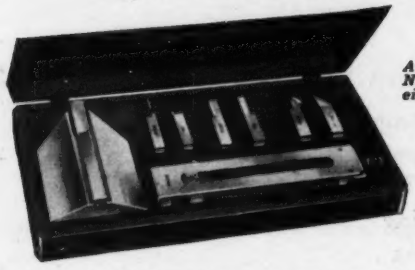

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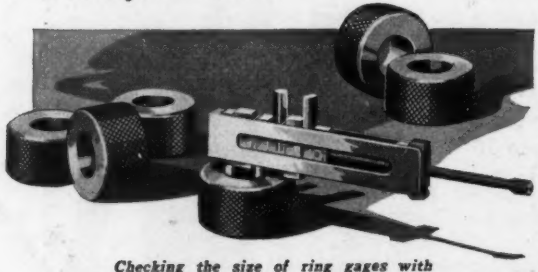

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(Continued from Page 272)

¶ MR. BRAY TOOT has been appointed instructor in manual training at Cadiz, Ohio.

¶ MR. JOHN F. SWANT has been appointed director of the vocational school at Beaver Dam, Wis. He succeeds A. H. Luedke.

¶ MR. A. B. CORSON, of South Seaville, N. J., has been appointed to the Cape May county vocational school board. He succeeds Frank Dickison.

Association and Convention News

INDUSTRIAL ARTS ROUND TABLE OF THE CHICAGO DISTRICT

The final meeting of the year for the Industrial Arts Round Table was held May 22 at the Y. M. C. A., with a large attendance, including a number of the committees working on standards for industrial arts.

The principal speaker was Mr. Byron Field, director of educational and training classes for the Commonwealth Edison Company. Mr. Field pointed out that there has been training in many departments for years and that the overhead and underground departments have well-developed systems of instruction. Training, said Mr. Field, varies with departments. New material, or a change in process, must be presented to both the foremen and the men. The job must be explained again by men who actually do the job, in order to prevent faulty instruction and poor production.

Mr. Field also spoke of the department of public contact, which checks overdue bills. Part of the training here consists of a survey of the public attitude. The person in charge of the department must cultivate a likeable appearance, must use the proper speech, and be well informed. The difficulties of the position are listed and arranged for study by a supervisor who also gives instruction in the elements of salesmanship.

There also are courses in management training in many departments. Here the subexecutive and the upper executive meet to study the problems of the company. There are external problems in the solution of which it is customary to seek aid from the universities. Despite the business depression, the training department is busy and has at present four full-time instructors and many part-time aids.

The round-table committee for 1931–32 consists of Mr. R. B. Bagby, of the Chicago Commercial Continuation School; Mr. W. C. Brubaker, of the Pullman Free School of Manual Training; Mr. O. W. Merriman, secretary of the industrial-arts department of Whiting, Indiana; and Mr. O. A. Oakes, of the New Trier High School, Winnetka.

At the next meeting in October, a trip will be made to the Chicago Avenue Water Tunnel. — *R. B. B.*

MAY MEETING OF THE BOSTON VOCATIONAL SOCIETY

The May meeting of the Vocational Education Society of Boston was held jointly with the Rhode Island Society at the Peleg Francis Farm in Rehoboth, Mass. The meeting was well attended. A number of prominent Rhode Island members were present, including Mr. Eric Anderson of Providence, Mr. Raymond Perry of the state department, and Dr. Carroll, and Mr. Rose of Providence.

As it was the last meeting of the school year, the following officers were elected: President, W. C. Brown, Boston; vice-president, Hugh Cox, Boston; secretary, L. J. Nutting, Bever-

(Continued on Page 15a)

(Continued from Page 14a)

ly; treasurer, L. A. Van Ham, Boston; librarian, Forrest Mason, Quincy.

President Gearon thanked the members for their splendid coöperation during the past year. After the luncheon, the meeting was turned over to the social committee. At the close of the meeting the hope was expressed that more joint meetings of the two societies might be arranged. — *L. A. Van Ham.*

SCHOOL CRAFTS CLUB BANQUET AT NEWARK

The School Crafts Club held its largest and most successful banquet at the Athletic Club, Newark, on May 16. A total of 90 members, including six or seven ex-presidents, were in attendance.

After a short business meeting which followed the dinner, a series of fifteen attendance prizes were distributed. These included table lamps, a saw, a brace, a set of carving tools, a steel tape, several sets of book ends, door stops, and other useful articles.

The feature of the evening was the interesting talk which Dr. Arthur Dean gave on "Then, Now, and Hereafter." In his discourse he traced the trends of industrial arts in America from the beginning when he was one of the members of the first manual-training classes in America, to the present day. He expressed the opinion that in the future we would see industrial arts and education in general grow bigger and better as each teacher endeavored to do his job in a better and more efficient manner, in accordance with the changes brought about by social, economic, and home conditions.

The next meeting of the club will be held the third Saturday in October in the Geneva Restaurant in New York City.— *A. M. H.*

THE INDUSTRIAL-EDUCATION CLUB MEETING

The May meeting of the Peoria Educational Club was held May 11, in the Junior High School at Pekin, Ill.

The subject of the meeting was "The Junior High School." The topic was timely, in view of the fact that Peoria is to begin the first of its three junior high schools.

Dr. Wm. T. Bawden gave a report of the meeting of the Western Arts Association at Louisville, Ky.

Mr. Harold Lynch, of Peoria, gave a talk on "The Junior High School," from the standpoint of the classroom teacher. Mr. L. P. Elliot, director of industrial education, Peoria, gave an insight into the junior high school from the supervisor's point of view.

Supt. Smith, of Pekin, gave the main address of the evening, speaking on the school finances and how they are handled. He pointed out that large classes, handled efficiently, are the best means of reducing operating costs.

A brief business meeting followed the program. Mr. W. T. Bawden was elected president, Mr. Clark secretary, and Mr. F. L. Barloga, treasurer.

ST. LOUIS MANUAL-ARTS TEACHERS HOLD BANQUET

The elementary manual-arts teachers of St. Louis, Mo., held a banquet meeting on May 22, at which time an organization was formed under the name of the St. Louis Manual-Arts Club.

Plans were made to have several of the outstanding men in the industrial-arts field address the club during the coming year. It was decided to coöperate in the national movement for establishing a new method of coöperative study in fixing standards of attainment in the industrial arts. Plans were begun for the forthcoming meeting of the Western Arts Association, to be held in St. Louis next year.

The following officers were elected: President, Mr. Leo Biddick, Blow School; vice-president, Mr. Thurston Ely, Meramec School; secretary, Mr. J. Ernest Kuehner, Blair School;

(Continued on Page 17a)

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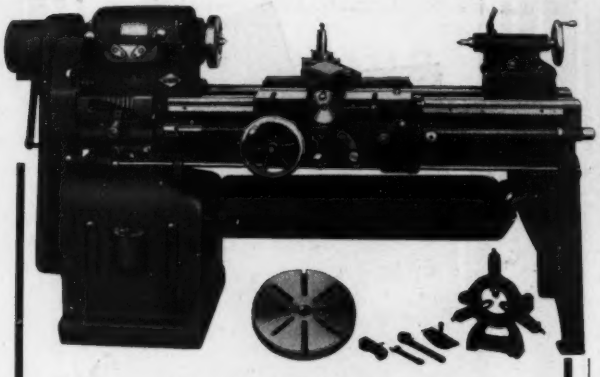

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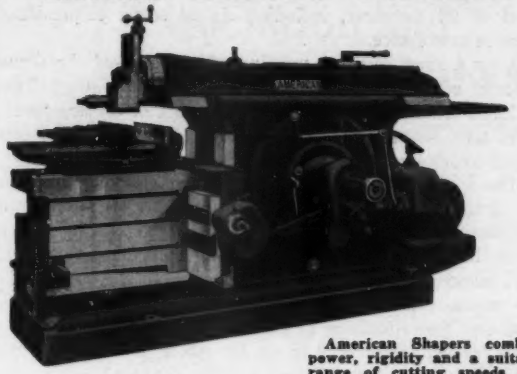

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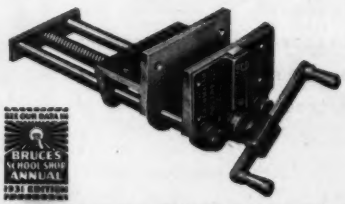

Continuous Screw woodworkers' vise equipped with new all-steel handle

When you buy Columbian you get vises designed for efficiency, strength and durability. They will give a lifetime of satisfactory service. Let us send you information on the complete line.

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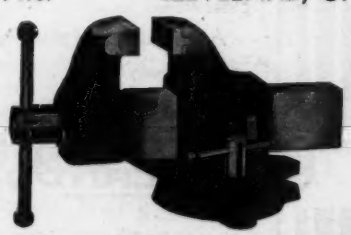
Unbreakable Swivel Base machinists' vise-ideal for shop use



No cutting tool is better than its edge
Keep the tools sharp

PLURALITY OILSTONE TOOL GRINDER

THE most convenient, serviceable and efficient tool sharpening machine ever made.

This Tool Grinder has been carefully designed to combine many new advantages with the essential features of former models. It combines five basic units in one machine: *coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, emery wheel,* and all accessible from two adjacent sides.

It is motor driven, ball bearing throughout, and every unit is thoroughly guarded.

Write for full descriptive bulletin.

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Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

treasurer, Mr. Charles Longfield, Bryan Hill School; sergeant at arms, Mr. Wayne Barnes, Madison School. — *J. Ernest Kuehner.*

News Notes

Industrial-Arts Exhibit of New York Schools and Vicinity

An exhibit of industrial arts for the schools of New York City and the vicinity was held on May 9. The exhibit was intended to give the students an opportunity to gain much in the way of new ideas and new problems regarding the industrial arts. It also provided a means of fostering a closer friendship between the instructors and the students of the various schools.

At the exhibit and conference, Dr. Ralph E. Pickett, of New York University, gave a talk, and Mr. L. J. Young, supervisor of shopwork in New York City, spoke on the subject, "What Constitutes a Good Teacher of Industrial Arts."

The conference was under the direction of Mr. F. W. Landers, head of the industrial-arts department of New York University.

Survey of Vocational Work at Terre Haute, Indiana

A survey of vocational work will be undertaken shortly at Terre Haute, Ind. The work will be undertaken by a committee, representing the schools, the merchants, and the local industries. It is planned to make some changes in the course of study, based upon the findings of the survey.

Auto-Mechanics Building at Antigo, Wisconsin

The vocational school at Antigo, Wis., has added a separate auto-mechanics building.

New Buildings for Boys' Training School in Bexar County, Texas

Plans have been completed for an administration building and two cottages at the Bexar County Training School for Boys. H. P. Smith is architect for the building program, which will cost approximately $50,000.

Vocational Shop at Tomah, Wisconsin

A vocational shop will be erected at the Government Indian School near Tomah, Wis. Carpentry and various forms of woodwork will be taught.

Vocational Guidance at Fostoria, Ohio

A program of vocational guidance has been developed at Fostoria, Ohio, to fit boys and girls for vocations to which they are adapted. The students will be permitted a study of the different vocations, professions, trades, and other activities.

Summer School at El Paso, Texas

The El Paso Vocational School at El Paso, Tex., will hold a summer school, beginning with June 1, and continuing for ten weeks. Shop classes were scheduled for the month of June.

Vocational School at Minneapolis, Minnesota

The school board of Minneapolis, Minn., has been asked to approve a five-year building program. The program includes provision for a girls' vocational high school, to cost $1,300,000.

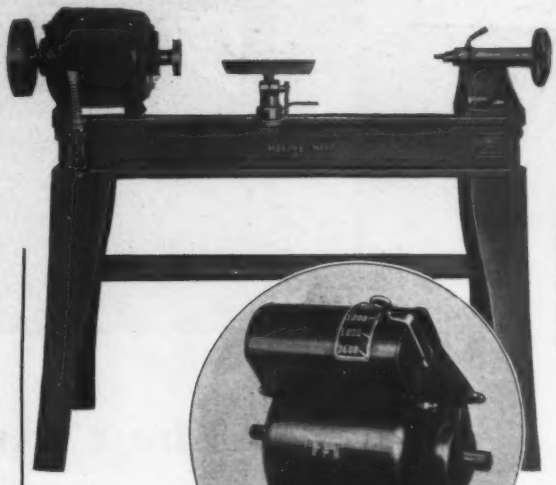
Airplane for State Trade School

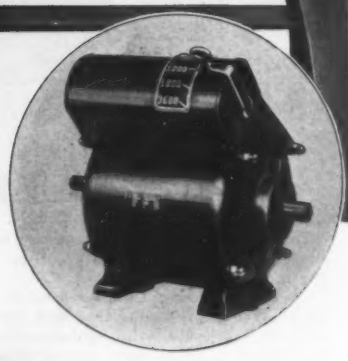
An airplane has been obtained for the use of the State Trade School at Putnam, Conn.

Vocational Teachers Complete Course at Oklahoma College

Vocational teachers of the Ardmore schools recently completed a two weeks' training course entitling them to residence credit at the Oklahoma A. and M. College during the school year.

A NEW LINE





THE "MOLINE" line of Quality Woodworking Equipment possesses many interesting and new features, doubly worthy of your consideration if you are looking for SAFE, EFFICIENT, DURABLE machines at prices that are Right.

These machines, designed especially for School Shop use, are fully guarded to insure MAXIMUM SAFETY—a very important feature for School Shop Machinery.

Every "MOLINE" machine is powered with an all Ball Bearing, fully enclosed, dust-proof Motor properly balanced to assure quiet, maximum operating power.

Descriptive folder and details will be gladly sent upon request.

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Moline, Illinois

It's Not The Cost, It's The Upkeep

Drawing tables are tall; they are made to lean against, consequently their joints are subject to unusually severe strain.

Sheldon Drawing Tables are made to stand the hardest service for a life time. One and three-eighths inch rails and stiles are used throughout; all joints are mortised and tenoned, glued with casein glue which when set is stronger than the wood itself, and cross-tie-bolted as shown above.

Sheldon Tables will serve longer, and cost less to maintain.

Write for Catalog showing Twenty Items For Art & Drawing.

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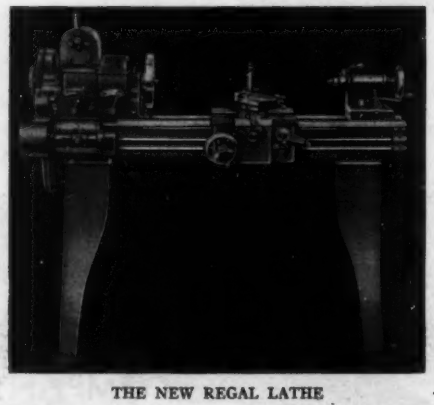
SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor or Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

ANNOUNCE NEW REGAL LATHE

The R. K. LeBlond Machine Tool Company, Cincinnati, Ohio, manufacturers of tools for the industrial and school field, has recently placed on the market its new Regal line of engine lathes.



THE NEW REGAL LATHE

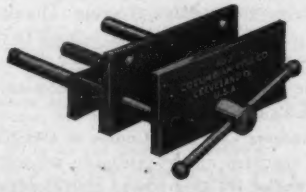
The new lathe, which resembles the larger line of LeBlond engine lathes, is designed for use in general service shops and school shops where the lighter types of lathework are done. It is a machine where compactness of design, safety, and simplicity of control are carried out to a remarkable degree.

The Regal lathe is built in five sizes ranging from 10 in. to 18 in. It is equipped with an eight-speed selective geared headstock and hardened-steel cluster gears. The final drive from shaft to spindle is through helical-type gears, and the head is driven by a self-contained motor located in the rear of the head on the upper part of the leg with multiple V belt drive. The machine is largely foolproof, and the feed mechanism has been strengthened where the heaviest strain occurs.

Complete information and prices may be obtained by any school-shop instructor upon request.

NEW COLUMBIAN WOODWORKING VISE

The Columbian Vise & Mfg. Co., Cleveland, Ohio, has just placed two new all-steel woodworking vises on the market. The



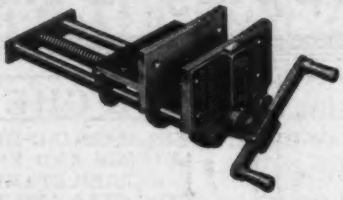
larger of the two has an adjustable handle applied to a continuous screw-type vise. This feature makes the vise practi-

(Continued on Page 21a)

ADVERTISING PAGES REMOVED

(Continued from Page 18a)

cally as fast as one of the rapid-acting types. The vise is staunchly built and will last a lifetime.



The Junior model is patterned after the larger sizes. It has 5½ by 1½-in. jaws which makes it just right where a low-priced vise is wanted for the lower-grade classes or for the home workshop.

Further information and prices may be had upon request.

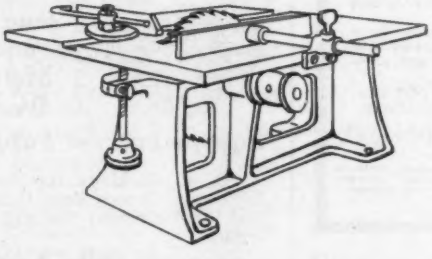
A NEW WALL CHART

The Oliver Machinery Company, Grand Rapids, Mich., has prepared a wall chart showing an outline drawing of a speed lathe upon which the names of all of the important parts have been placed. A cross-sectional view of the Kimble headstock with the names of the parts given is also shown. This valuable piece of illustrative material for the school shop is about 24 by 18 in.

It can be obtained by teachers of industrial arts and vocational education upon request.

CASTINGS FOR SCHOOL USE

The Designers Company, of Racine, Wis., has placed on the market a line of castings for school use. It consists of castings to be worked up in the machine shop as projects for students and for light-weight school-shop equipment.

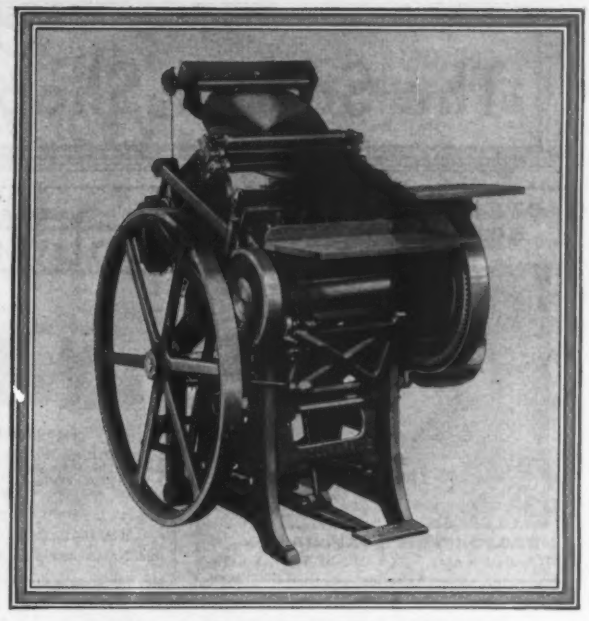


Small woodworking lathes, jig saws, drill presses, grinders, and vises, and other standard castings are offered. All parts are thoroughly worked out and have been tested in completed machines. Special attention has been given to the machining problem so that the average school shop may handle each job without difficulty. Blue prints for instructional purposes are furnished with each set.

Complete information will be sent to any shop instructor who will write to the Designers Company at 725 Munroe Ave., Racine, Wis.

SOLVING THE SCHOOL-SHOP STORAGE PROBLEM

The Durabilt Steel Locker Co., Aurora, Ill., is issuing a booklet entitled "Steel Storage Equipment for the Modern School Shop" which is a reprint of an article that appeared in the 1931 edition of *Bruce's School Shop Annual* entitled "Solving School-Shop Storage Problems." Anyone interested in steel storage cabinets which really satisfy the needs of the many requirements that school use places on storage cabinets, may receive this helpful booklet upon request.



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Language, grammar, rhetoric and other cultural subjects become live, important things to him, worthy of his attention and respect. Appreciation of the artistic, color harmony and design values, together with the development of taste, all follow naturally and easily.

Whether the boy ultimately follows the printing trade or not, C&P Presses provide practical training of utmost value to his future career. It is because of this fact that Chandler & Price installations have assumed such an important place in educational progress.

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The School Shop Shopping Guide

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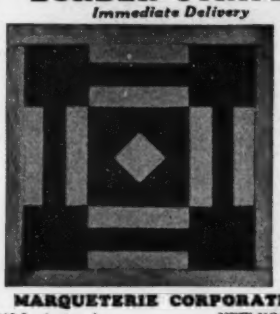

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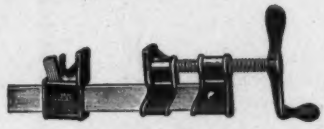

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15" x 6' South Bend Lathe, $200.00
16" x 6' Hendey Yoke Head Lathe, $450.00
16" Queen City Crank Shaper, $375.00
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